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VOL. XI. MED——MID

INDOCTI DISCANT, ET AMENT MEMINISSE PERITI.

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ENCYCLOPÆDIA.

MEDALS.

Utility of them in Hiſtory, &c.

MEDAL, denotes a piece of metal in the form of coin, ſuch as was either current money among the ancients, or ſtruck on any particular occaſion, in order to preſerve to poſterity the portrait of ſome great perſon, or the memory of ſome illuſtrious action. Scaliger derives the word *medal* from the Arabic *methalia;* a ſort of coin with a human head upon it. But the opinion of Voſſius is generally received; viz. that it comes from *metallum*, "metal;" of which ſubſtance medals are commonly made.

SECT. I. *Utility of Medals in Hiſtory, and various other Sciences.*

THERE are few ſtudies of more importance to hiſtory than that of medals; the ſole evidence we can have of the veracity of an hiſtorian being only ſuch collateral documents as are evident to every body, and cannot be falſified. In modern times, theſe are found in public memoirs, inſtructions to ambaſſadors, and ſtate papers of various kinds. Such memorials, however, are ſubject to various accidents, and beſides commonly remain in the countries where they are firſt publiſhed, and cannot therefore give to the world at large that perfect and entire ſatisfaction which ought to be derived from genuine hiſtory; ſo that more durable and widely diffuſed monuments are ſtill to be wiſhed for. Such are public buildings, inſcriptions, and ſtatues; but theſe, excepting a few inſtances of the two laſt, are always confined to particular countries: ſo that medals alone remain as infallible documents of truth, capable of being diffuſed over all countries in the world, and of remaining through the lateſt ages.

1
Various writers on medals.

The firſt who ſhowed the importance of medals in aſcertaining the dates, and arranging the order of events, in ancient hiſtory by means of medals, was Vaillant, in his Hiſtory of the Kings of Syria, printed at Paris in 1681. By medals alone, he has been enabled to fix the chronology and important events of hiſtory, in the three moſt ancient kingdoms of the world, viz. Egypt, Syria, and Parthia. Many coins have been diſcovered ſince his time, which confirm the accounts he has given. He was followed in this method by Father Hardouin, though with leſs ſucceſs. Hardouin's beſt work is his *Herodiades*, or Series of Succeſſors to Herod king of Judæa. The ſame plan was purſued by Noris, in his learned Treatiſe on the Syro-Macedonian princes, and by Bayer in his Hiſtory of Oſrhoene, as well as by Froelich, in the work intitled *Annales Regum et Rerum Syriæ*, Vien. 1754, and another named Kevenhullers *Regum veterum Numiſmata Anecdota auctore Perrara*, Vien. 1752, 4to, of which Froelich was properly the author. Corſini and Cary likewiſe publiſhed works of a ſimilar nature; the former in 1744, *De Minniſari, aliorumque Armeniæ Regum, Nummis*, &c.; the latter 1752, *Hiſtoire des Rois de Thrace, et du Boſphore Cimmerien, eclaircie par les Medailles.*

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2
Of the Greek coins.

The ſtudy of the Greek coins does not ſhow the dates of events, though it illuſtrates the chronology of reigns. This defect, however, is abundantly ſupplied by thoſe of Rome, which commonly mark the date of the prince's conſulſhip, the year of his tribunician power; giving alſo, upon the reverſe, the repreſentation or poetical ſymbol of ſome grand event. The year of the tribunician power is ſometimes imagined by antiquaries to be ſynonymous with that of the emperor's reign: but this is not the caſe; and Mr Pinkerton is at ſome pains to ſet them right in this reſpect. He finds fault with Julius Cæſar, when he aſſumed the ſovereign authority, for taking upon him the title of Perpetual Dictator, as being ſynonymous with that of king or abſolute governor, which the Romans abhorred. "He ought (ſays our author), under the diſguiſe of ſome ſupreme magiſtrate of annual election, to have lulled the people with a dream, that they might terminate his power when they pleaſed; or that he himſelf would reſign it, when the neceſſities of ſtate which had required his temporary elevation had ſubſided." To this error Mr Pinkerton aſcribes the aſſaſſination of the Dictator, and commends the policy of Auguſtus, who, with far inferior abilities, continued in poſſeſſion of the moſt abſolute authority as long as he lived. The tribuneſhip was an office of annual election; and if put into the hands of any others than plebeians, muſt have been the ſupreme power of the ſtate, as it belonged to that office to put a negative upon every public meaſure whatever. Auguſtus, being of ſenatorial rank, could not aſſume this office; but he inveſted himſelf with the tribunician power, which had the advantages of appearing to be only a temporary ſupremacy, though in truth it was continued during his whole lifetime. Towards the end of his reign, he frequently aſſumed his deſtined ſucceſſor, Tiberius, for his colleague, though in the beginning he had enjoyed it alone. This, with his artifice of reſigning his power every ten years, and re-aſſuming

3
Method uſed by Auguſtus to ſecure his power.

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re-aſſuming it at the deſire, as was pretended, of the ſenate, ſecured his ſovereignty as long as he lived.—His example was followed by his ſucceſſors; ſo that moſt of them have the inſcription *Tribunicia Poteſtate* upon their medals, with the date affixed to it thus *Tr. Pot.* VII. Yet though this date generally implies the year of the emperor's reign, it ſometimes happens that the emperor, by ſpecial favour from a former prince, had been endowed with this title before he came to the throne, as being the ſucceſſor to that prince, of which we have already given an inſtance in Tiberius. Beſides the tribunician power, the emperors very frequently enjoyed that of the conſuls; and the date of their conſulſhip is frequently expreſſed in their coins.

The office of Pontifex Maximus was likewiſe aſſumed by the Roman emperors in order to ſecure themſelves in their authority; which, Mr Pinkerton obſerves, was one of the moſt efficacious artifices they could have fallen upon. "In the Greek heroic times (ſays he), king and prieſt were carefully united in one perſon; and when ſovereigns aroſe in Denmark and Sweden, the ſame plan was followed, as appears from Snorro, and other writers. Nothing could lend more ſecurity to the perſon of the monarch than an office of ſupreme ſanctity, which alſo confirmed his power by all the terrors of ſuperſtition. Even the Chriſtian ſyſtem was afterwards debaſed by a mock alliance with government; though it be clear from the whole New Teſtament, that ſuch an alliance is ſubverſive of its genuine inſtitution, and the greateſt of all its corruptions. But the Roman Catholic clergy, in the dark ages, were the authors of 'no church no king,' for their own intereſt; while the Roman emperors only ſought to ſtrengthen their power by the dark awe of ſuperſtition. The title of Pontifex Maximus was ſo important, that it was retained even by the Chriſtian emperors till the time of Gratian. Its influence in the ſtate was, indeed, prodigious. Cicero obſerves, that to this office were ſubject temples, altars, penates, gods, houſes, wealth, and fourtune of the people.—That of augur is alſo borne by many emperors; and its authority was ſuch, that by the law of the twelve tables no public buſineſs could be tranſacted without a declaration from the augur concerning its event.—The pro-conſular power was alſo given to Auguſtus and the other emperors. It conferred a direct authority over all the provinces, and implied the emperor to be chief pro-conſul, or governor of each, and of all. Another ſpecial power aſſigned to the emperors, but not occurring on coins, was the *Jus Relationis Tertiæ, Quartæ,* &c. or the right of making three or four motions in the ſenate on the ſame day, while the ſenators could only propoſe one.

Hence our author infers that medals afford the moſt authentic documents of the Roman hiſtory, in particular, that could have been invented by man.—The hiſtories of Nerva and Trajan are much better elucidated by medals than by authors; for the hiſtory of Suetonius ends with Domitian, and the *Hiſtoriæ Auguſtæ Scriptores* begins with Adrian: ſo that the reigns of the two emperors juſt mentioned are almoſt unknown; and Mr Pinkerton is ſurpriſed that none of the learned have attempted to ſupply the defect.—"Capitolinus (ſays he), in his life of Maximinus Junior, is quite puzzled to know if Maximus and Pupienus were two emperors, or two names for the ſame. Had he happened on any of thoſe coins which bear M. Cl. Pupienus Maximus Aug. he would have ſeen at once that Maximus was only another name for Pupienus.'

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4 Uſe of medals in geography.

5 In natural hiſtory;

6 In architecture.

7 In the fine arts.

Medals are uſeful in other ſciences beſides hiſtory. In geography, we find the ſituation of towns determined by their vicinity to ſome noted river, mountain, &c. Thus, ΜΑΓΝΗΤΩΝ ΣΙΠΥΛΟΥ ſhows that Magneſia was ſituated under Mount Sipylus. In like manner, it is ſhown from a medal, that Epheſus ſtood on the river Cayſter; and there is extant a medal, bearing an inſcription, which ſignifies Alexandria on the Scamander; a name given to Troy by Alexander the Great. The reverſe has upon it the famous Apollo Smintheus of Homer. In natural hiſtory, alſo, medals are uſeful chiefly from the coins ſtruck on the celebration of the ſecular games, in which the figures of various animals are preſerved; and thus it may very often be determined whether any animal be known to the ancients or not. On many of the Greek medals are ſeveral uncommon plants and animals. Thus, on moſt of the medals of Cyrene is the figure of the celebrated *Sylphium*; and on thoſe of Tyre, the ſhell-fiſh from which the famous Tyrian purple was procured. By means of medals, alſo, the exact delineations of many noble edifices are preſerved, though not even a veſtige of their ruins be now exiſting; ſo that the uſes of them to the architect are very conſiderable. To the connoiſſeur they are abſolutely neceſſary; becauſe by them alone he is enabled to aſcribe ancient buſts and ſtatues to their proper perſons, with multitudes of other points of knowledge which cannot be otherwiſe determined. The elucidations of obſcure paſſages in ancient authors by means of medals, are ſo numerous and well known, that it is needleſs to inſiſt upon them.

8 Latin medals of uſe to a poet.

Mr Addiſon has treated the connection betwixt medals and poetry at conſiderable length; but Mr Pinkerton finds fault with him for preferring the Latin to the Greek poets. He obſerves alſo, that the knowledge of Greek medals is moſt neceſſary for a ſculptor, and perhaps an architect; but an acquaintance with Latin ones is preferable for a poet, or perhaps a painter. The reaſon of this difference is, that the former generally have on the obverſe the head of ſome king, god, or goddeſs, of exquiſite relief and workmanſhip; but the reverſe ſeldom affords much fancy of ſymbol in the early Greek coins; and in the imperial Greek coins, is chiefly impreſſed with the temples of their deities. To a perſon of poetical imagination, however, the Roman coins afford the greateſt entertainment, from the fine perſonifications and ſymbols to be found on their reverſes; of which our author gives the following inſtances.

9 Perſonifications on Roman medals.

"HAPPINESS has ſometimes the caduceus, or wand of Mercury, which Cicero, 1. *Offic.* tells us was thought to procure every wiſh. She has in a gold coin of Severus heads of poppy, to expreſs that our prime bleſs lies in oblivion of miſfortune.

"HOPE is repreſented as a ſprightly girl, walking quickly, and looking ſtraight forward. With her left hand

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hand ſhe holds up her garments, that they may not impede the rapidity of her pace; while in her right hand ſhe holds forth the bud of a flower; an emblem infinitely more fine than the trite one of an anchor, which is the ſymbol of Patience and not of Hope. This perſonification, with ſome others, muſt have been very familiar to the ancients; for often in this and in a few more inſtances, no name, as SPES AUG. or the like, is inſerted in the legend.

" ABUNDANCE is imagined as a ſedate matron, with a cornucopia in her hands, of which ſhe ſcatters the fruits, and does not hold up her cornucopia and keep the contents to herſelf, as many modern poets and painters make her do.

" The emperor Titus, having cauſe to import a great ſupply of corn during a ſcarcity at Rome, that ſupply, or the ANNONA, is finely repreſented as a ſedate lady, with a filled cornucopia in her left hand, which ſhe holds upright, to indicate that ſhe does not, however, mean to ſcatter it, as Abundance has a title to do, but to give it to Equity to deal out. This laſt particular is ſhown by her holding a little image of Equity, known by her ſcales and *haſta pura*, or pointleſs ſpear, in her right hand, over a baſket filled with wheat. Behind the ANNONA is the prow of a ſhip decked with flowers, to imply that the corn was brought by ſea (from Africa), and that the ſhips had had a proſperous voyage. The beſt poet in the world would not have given us a finer train of imagery; the beſt painter would have been puzzled to expreſs ſo much matter in ſo ſmall a compaſs.

" SECURITY ſtands leaning upon a pillar, indicative of her being free from all deſigns and purſuits; and the poſture itſelf correſponds to her name. Horace, in deſcribing the wiſe man, mentions his being *teres atque rotundus*; round and poliſhed, againſt all the rules of chance: an idea ſeemingly derived from the column upon which this ideal lady reclines.

" The emblems of PIETY, MODESTY, and the like, are equally appoſite and poetical.

" The happineſs of the ſtate is pictured by a ſhip ſailing before a proſperous breeze: an image than which the ſuperlative genius of Gray could find none more exquiſite; and he has accordingly uſed it in his moſt capital production " The Bard," with due ſucceſs.

" The different countries of the then known world are alſo delineated with great poetical imagery. It affords patriotic ſatisfaction, particularly to a Briton, to ſee his native iſland often repreſented upon the earlieſt imperial coins ſitting on a globe, with a ſymbol of military power, the *labarum* in her hand, and the ocean rolling under her feet. An emblem almoſt prophetic of the vaſt power which her dominion over the ſea will always give her, provided ſhe exerts her element of empire with due vigour and perſeverence.

" Coins alſo preſent us with Achaia, Africa, Alamannia, Alexandria, Arabia, Armenia, Aſia, Bithynia, Cappadocia, Dacia, Dardania, Egypt, Gallia, Hiſpania, Italia, Judæa, Macedon, Mauritania, Pannonia, Parthia, Phrygia, Sarmatia, Sicily, Scythia, Syria, and the rivers Danube, Nile, Rhine, Tyber. This perſonification of provinces ſeems to have ariſen from the figures of provinces carried in triumphs; as the perſonification of our old poets ſprung from the ideal perſons actually repreſented in the myſterial plays.

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" There is one colonial medal of rude execution of Auguſtus and Agrippa, which has a high claim to merit in diſplaying the ancient poetical imagery. It is inſcribed IMP. and DIVI. F. and on the reverſe, the conqueſt of Egypt is repreſented by the metaphor of a crocodile, an animal almoſt peculiar to that country, and at that period eſteemed altogether ſo; which is chained to a palm-tree, at once a native of the country, and ſymbolic of victory.

10 Medals uſeful to a painter.

" As the reverſes are ſo uſeful for knowledge of perſonification, ſymbols of countries and actions, and the like; ſo the portraits to be ſeen on old coins are no leſs important to a painter; the high merit of a great number of them, in every character, juſtly intitling them to be regarded as the beſt ſtudies in the world. Not to mention, that, to an hiſtoric painter, the ſcience of ancient medals is abſolutely neceſſary, that he may delineate his perſonages with the features they really bore while in exiſtence. This can only be attained in this way, or from ſtatutes and buſts; any one of which will coſt as much as hundreds of medals; and indeed a collection of ſuch is only attainable by princes."

11 To a ſculptor.

The ſame things which render the ſtudy of medals important to a painter, do ſtill more ſo to a ſculptor; and in this particular, the ſtudy of the Greek coins is remarkably uſeful. The ſkill of the Greeks in the art of ſculpture has always been admired throughout the world; and on their coins the heads of ſeveral deities are repreſented in the moſt exquiſite *alto-relievo*. Our author therefore thinks it ſtrange, that the Grecian coins ſhould have hitherto been ſo little attended to by men of learning and taſte. They may have been looked upon, he ſuppoſes, as belonging only to the province of the antiquary; but he aſſures us, that the Greek medals will afford ſatisfaction to the perſons who value them only as pieces of workmanſhip. In moſt reſpects, they greatly excel thoſe of Rome even in its beſt times; which our author ſuppoſes to have been from the days of Auguſtus to Adrian. " In the days of Adrian, in particular (ſays he), the Roman mint ſeems to have been the very ſeat of art and genius; witneſs the vaſt number of exquiſite perſonifications, engraven with equal workmanſhip, which ſwarm on the medals of that prince. Yet from his time down to Poſthumus, coins of admirable workmanſhip are to be found. Thoſe of the Fauſtinas and Lucilla deſerve particular mention. There is one, and not an uncommon one, of the latter in great braſs, which yields to nothing of the kind. The reverſe is a Venus with the name around her. The portrait of the obverſe ſeems to ſpring from the field of the coin; it looks and breathes, nay talks, if you truſt your eyes. The coins of Tarſus are extremely remarkable for a kind of perſpective in the figures, as Froelich obſerves. On others are found triumphal arches, temples, fountains, aqueducts, amphitheatres, circi, hippodromes, palaces baſilicas, columns and obeliſks, baths, ſea-ports, pharoſes, and the like. Theſe furniſh much pleaſure and inſtruction to the architect, and ſerve to form his taſte to the ancient manner; that manner which unites perfect ſimplicity with ſublimity and grace; that manner which every age

Entertainment from ſtudying them.

age admires, in proportion as it has genius to imitate."

Sect. II. *Entertainment ariſing from the ſtudy of Medals.*

Besides the purpoſes which the ſtudy of medals anſwers in the uſeful arts, a great variety of ſources of entertainment are to be found in it. Mr Pinkerton obſerves, that the moſt barbarous nations are more pleaſed with the rudeſt efforts of art, than with the moſt admirable works of nature; and that in propertion as the powers of the mind are large and various, ſuch are alſo the pleaſures which it receives from thoſe ſuperlative productions of art, which can only be the offſpring of vaſt genius. Hence works of art are agreeable both to the enlightened and to the ignorant. The chief amuſement, therefore, which attends the ſtudy of medals, originates from the ſtrength and ſpirit, the finiſh and beauty, which the engraver has diſplayed in the execution of them. It beſides gives a kind of perſonal acquaintance with the perſons of whom they are the repreſentations. Portraits have always been highly entertaining to mankind; and our author is of opinion, that the love of them gave riſe both to painting and ſculpture. They are no where to be found ſo ancient, numerous, and ſo well preſerved as in medals. Amuſement is alſo derived even from the repreſentations of ideal heads and perſons; nay, even from the minuteſt ſymbols. Thus the Greek coins of cities preſent us with heads of deities of exquiſite workmanſhip, apparently copied from ſtatues or paintings; ſo that we may even gueſs at the works of Apelles and Praxiteles from ſome of the Greek medals. Their reverſes afford ſtill greater variety; there being ſcarce an object either in art or nature which is not repreſented upon ſome of them: and to the ſatiſfaction ariſing from a view of theſe, we may likewiſe add that of beholding, in a lively manner, the dreſſes, manners and cuſtoms, religious and civil ceremonies, of the ancients: ſo that from medals we may obtain an intereſting hiſtory of manners; which, though very lately cultivated, may perhaps afford the moſt uſeful and entertaining of all the provinces of hiſtory.

12 Difference betwixt a medalliſt and antiquary.

There is a very conſiderable difference betwixt the ſtudy of medals and that of a mere antiquary. The latter frequently ſeems to take delight in coins merely in proportion to their ruſt and deformity; ſo that it is often a recommendation of ſome of their pieces, that neither portrait, reverſe, nor legend, can be diſcovered; at leaſt in ſuch manner as can be intelligibly explained. "The delight of the antiquariſt (ſays Mr Pinkerton) may be called a depraved appetite of the mind, which feeds on traſh, and fills itſelf with emptineſs. It is perhaps a mere childiſh curioſity mingled with caprice and hypochondriciſm. Againſt this character the ridicule of Severus is particularly ſhot, but with little effect; for our antiquiſts exceed in viſions and nonſenſe. I ſay *antiquiſts*; for the name of antiquary is ſacred. By *antiquary*, in foreign countries, is implied a man who illuſtrates their ancient laws, manners, poetry, but eſpecially their ancient hiſtory. There men of the moſt elevated minds are antiquaries; as Muratori, Leibnitz, Monteſquieu, Du Bos. Here men of talents muſt not ſtoop, forſooth, to ſtudies the moſt important to their country, but leave its antiquities to chance. Every thing is important but our hiſtory; and we are profound in every ancient matter that is ſuperficial; and ſuperficial in what is profound. Even England cannot boaſt of one general hiſtorian, but truſts to the inaccuracy of Rapin, and the ignorant neatneſs of Hume. It is therefore no wonder that the ſtudy of antiquity is here ridiculous, though moſt important in other countries; none requiring greater talents, learning, or induſtry. But the hiſtoric antiquary has the pleaſure of benefiting ſociety, and enlightening whole nations, while the medallic has only an innocent amuſement. This amuſement, conſidered merely as riſing from antiquarian objects, has not been explained, though felt by moſt people, and more by the learned. It ſeems analogical with that which we derive from an extenſive proſpect: for as the mind delights to expand itſelf into diſtant places, ſo alſo into diſtant times. We connect ourſelves with theſe times, and feel as it were a double exiſtence. The paſſions are ſingularly affected by minute circumſtances, though mute to generalities; and the relicts of antiquity impreſs us more than its general hiſtory."

History.

Sect. III. *Hiſtory of Medals.*

The ſtudy of medals is not of very ancient date: None of the claſſic writers give any account of collections of them; though indeed many little particulars are paſſed without notice by them. In the times of the Greeks, a collection of ſuch coins as then exiſted muſt have been but little regarded, as conſiſting only of thoſe ſtruck by the numerous little ſtates which at that time uſed the Greek characters and language. Hence they would have had an air of domeſtic coinage, and no attention would have been paid to them, however exquiſite their workmanſhip might have been. The little intercourſe at that time carried on betwixt the different provinces alſo, greatly impeded any communication of knowledge to thoſe who wrote hiſtories; ſo that it is no wonder to find any ſmall collections that might then have exiſted altogether unnoticed by them.

13 Greek coins imitated by the Romans.

Almoſt as ſoon as any communication was opened between the Greeks and Romans, the latter treated the arts of the Greeks with all due reſpect and applauſe. Their coins were imitated by the Romans, and preſerved in cabinets by the ſenators among their choiceſt treaſures. Suetonius informs us, that on ſolemn occaſions Auguſtus was accuſtomed to preſent his friends with medals of foreign ſtates and princes, along with other valuable teſtimonies of his friendſhip. In a more advanced period of the Roman empire, however, individuals would undoubtedly form collections of coins peculiar to their own ſtate; for Dr Stukely, in his Medallic Hiſtory of Carauſius, informs us, that a complete ſeries of ſilver coins was lately found in Britain, containing all the emperors down to Carauſius incluſively. From Banduri we alſo know, that certain Greek coins were ſpecially preſerved by the Romans; and it appears from their code, that ancient gold and ſilver coins were made uſe of inſtead of gems; to which diſtinction thoſe of Sicily were particularly intitled. From the decline of the Roman empire till towards the end of the 5th century, almoſt all branches of literature were involved in darkneſs, and the medallic ſcience among the reſt. While the Chriſtian dominion of Conſtantinople laſted, indeed, almoſt all the arts and ſciences may be ſaid to have been kept within its own boundaries; though the Arabs and eaſtern nations had ſome arts and ſciences of their own: but after the deſtruction of the imperial city by the Turks, the Greeks were once more compelled to become fathers to the European Science. Even before this time, indeed, ſome veſtiges of a revival of literature had appeared in Italy; "and ſo intimate and neceſſary a connection (ſays Mr Pinkerton) has now the ſtudy of medals with that of ancient erudition, that on the the earlieſt appearance of a revival of the latter, the former was alſo diſcloſed."

14
Collectors of medals.

The firſt among the moderns who began to ſtudy the medallic ſcience was Petrarch. Being deſired by the Emperor Charles IV. to compoſe a book containing the lives of eminent men, and to place him in the liſt, he replied, that he would do ſo whenever the emperor's life and conduct deſerved it. In conſequence of this converſation be afterwards ſent the emperor a collection of gold and ſilver coins bearing the repreſentations of eminent men, with an addreſs ſuitable to his former declaration. A collection of coins was made in the next age by Alphonſo king of Arragon; but though this monarch collected all that could be found throughout Italy, we know that there could not have heen very many, as the whole were contained in an ivory cabinet, and carried always about with him. A very conſiderable collection was made by Anthony Cardinal St Mark, nephew to Eugene IV. who aſcended the pontifical chair in 1431; and ſoon after the grand muſeum at Florence was begun by Coſino de Medici, where a collection of ancient coins and medals had a place among other curioſities. Corvinus king of Hungary about the ſame time formed a noble collection of coins along with ancient manuſcripts and other valuable relicts of antiquity.

Mr Pinkerton conſiders Agnolo Poliziano, more commonly known by the name of *Angelus Politianus* as the firſt writer who adduced medals as vouchers of ancient orthography and cuſtoms. He cites different coins of the Medicean collection in his Miſcellanea written about the year 1490. By means of a cabinet of medals collected by Maximilian I. emperor of Germany, Joannes Huttichius was enabled to publiſh a book of the lives of the emperors, enriched with their portraits, delineated from ancient coins. It is generally ſuppoſed that this book, which appeared in 1525, was the firſt work of the kind; but Labbe, in his *Bibliotheca Nummaria*, mentions another named *Illuſtrium Imagines*, by one Andreas Fulvius, printed in 1517, in which moſt of the portraits ſeem to be from medals. About the year 1512 alſo, Guillaume Bude, a French author, had written his treatiſe *De Aſſe*, though it was not printed till many years afterwards. M. Grollier, treaſurer of the French armies in Italy, during part of the 16th century, had a great collection of coins of different kinds of metals. After his death, his braſs medals were ſent to Provence, and were about to be ſent into Italy; when the king of France, having got information of the tranſaction, gave orders to ſtop them, and purchaſe the whole at a very high price for his own cabinet of antiquities. M. Grollier had an aſſortment of gold and ſilver as well as of braſs medals: the cabinet in which they were contained, fell two centuries afterwards into the hands of M. L'Abbe de Bothelin; and was known to have been that of Grollier from ſome ſlips of paper, on which was his uſual inſcription for his books, *Joannis Grollierii, et amicorum.*

15
Number of cabinets

Cotemporary with Grollier was Guillaume de Choul, who was likewiſe a man of rank and fortune. He had a good collection of medals, and publiſhed many in his Treatiſe on the Religion of the ancient Romans in 1557. In the low countries we know, from the letters of Eraſmus, that the ſtudy of medals was begun about the beginning of the 16th century. About the middle of that century, Hubertzus Goltzius, a printer and engraver, travelled over moſt countries in Europe ſearching for coins and medals, in order to publiſh books concerning them. From one of theſe works it appears, that there were then in the low countries 200 cabinets of medals; 175 in Germany, upwards of 380 in Italy, and 200 in France. It is probable, however, that there are now four times as many in theſe countries, beſides 500 in Britain; but we are not to imagine that all theſe were grand collections, for of ſuch there are not above a dozen even in Italy: moſt of thoſe juſt mentioned were of the claſs named *caſkets* of medals, containing from 100 to 1000 or 2000.

16.
Number of coins found in Britain.

There are few countries, Italy excepted, in which a greater number of coins have been found than in Britain; though we are by no means well acquainted with the time when the ſtudy of them commenced. Mr Pinkerton ſuſpects that Cambden was one of the firſt, if not the very firſt, Britiſh author who produced medals in his works, and who muſt have had a ſmall collection. Speed's Chronicle, publiſhed in the 17th century, was illuſtrated with coins from Sir Robert Cotton's cabinet. Gorlæus's collection was purchaſed by Henry prince of Wales, brother to Charles I. to whom he left it at his death. According to Joſeph Scaliger, it conſiſted of 30,000 coins and medals. A collection 5500 coins was purchaſed by Archbiſhop Laud for L.600, and given to the Bodleian library. Thomas earl of Arundel, earl-marſhall of England, well known from the Arundelian, tables and other antiquities which he imported from Greece and Italy into Britain, had a rich cabinet of medals collected by Daniel Niſum. The dukes of Buckingham and Hamilton, Sir William Paſton, Sir Thomas Fanſhaw of Ware-Park, Sir Thomas Hanmer, Ralph Sheldon, Eſq; Mr Selden, &c. are enumerated by Evelyn as collectors of medals. Charles I. as well as his hiſtorian the earl of Clarendon, were alſo collectors. The king had a very fine cabinet; which, however, were diſſipated and loſt during the civil commotions. Oliver Cromwell had a ſmall collection; and the cabinet of Charles II. is mentioned by Vaillant in the preface to his treatiſe intitled *Nummi in Coloniis*," &c. This branch of magnificence has not been much attended to by ſucceeding Britiſh monarchs; though his preſent majeſty has a very good collection of ancient gold coins.

17
Britiſh cabinets.

A great number of fine cabinets have been formed in Britain ſince the time of Evelyn. About the year 1720 Haym makes mention of thoſe of the duke of Devonſhire, the earls of Pembroke and Winchelſea,

Sir

Of what conſtructed

Sir Hans Sloane, Sir Andrew Fountaine, Mr Sadler, Mr Abdy, Mr Wren, Mr Chicheley, and Mr Kemp. At preſent there are many remarkable collections; but that of the late Dr Hunter is deſervedly eſteemed the moſt remarkable in Europe, excepting that of the French king. It was not only formed at a great expence, but with much care and labour; many foreign medals offered to it having been rejected. The other remarkable collections are thoſe of the duke of Devonſhire, the earl of Pembroke, earl Fitzwilliam, formerly the marquis of Rockingham's, the honourable Horace Walpole, the reverend Mr Cracherode, the reverend Mr Southgate, Mr Townley, Mr R. P. Knight, Mr Edward, Knight, Mr Tyſon, Mr Barker, Mr Brown, and ſeveral others. The muſeum and univerſities have alſo collections; as well as the lawyers library, and the colleges in Scotland.

Sect. IV. *Materials of which Medals are conſtructed.*

18 Ancient gold coins.

Medals are formed of gold, ſilver, and the various modifications of copper. The gold uſually made uſe of in coinage is about the fineneſs of 22 carats; and as the art of purifying this metal was very much unknown in former times, the moſt ancient medals are for this reaſon much more impure than the modern coins. Gold is never found in its native ſtate above 22 carats fine; and the very ancient medals are much under that ſtandard. Many of them are compoſed of a mixture of gold and ſilver, called by the ancients *electrum*. The gold medals were made of much finer metal after Philip of Macedon became poſſeſſed of the gold mines of Philippi in Thrace, and the medals of his ſon Alexander the Great are equally fine; as well as thoſe of ſome other princes of that age. Thoſe of the Egyptian Ptolemies are of the fineneſs of 23 carats three grains, with only one grain of alloy. The Roman coins are very pure even from the earlieſt times; the art of refining gold being well known before any was coined at Rome. Some authors are of opinion, that the Roman coins begin to fall ſhort of their purity after the time of Titus; but Mr Pinkerton denies that any thing of this kind takes place till the time of the Emperor Severus; and even then only in a very few inſtances. Moſt of the Roman gold was brought from Dalmatia and Dacia, where that metal is ſtill to be met with. A very remarkable circumſtance is obſerved in the eaſtern part of Hungary, which belonged to the ancient Dacia: It germinates in the vines of Tokay, and is found in their ſtems; as it is elſewhere in the ſtraw of corn.

19 Metal called *electrum*.

Pliny informs us, and indeed it is generally known, that gold and ſilver are found mixed together in the earth. When the ſilver amounted to one-fifth part of the gold, the metal was called *electrum*; but ſometimes the quantity of ſilver was added artificially. The gold was in thoſe days as well as at preſent refined by means of mercury: and the ancient artiſts had certainly attained to great perfection in this branch of metallurgy; as Bodin tells us, that the goldſmiths of Paris upon melting one of Veſpaſian's gold coins found only $\frac{1}{788}$ part of alloy.

20 Ancient ſilver.

Moſt of the ancient ſilver, particularly that of Greece, is leſs pure than that of ſucceeding times; even the Roman ſilver is rather inferior to the preſent ſtandard, and that from the very beginning; but in the time of Severus, the ſilver appears very bad, and continues ſo until the time of Diocleſian. Many writers upon this ſubject have miſtaken the *denarii aerei*, "coins of braſs waſhed with ſilver," for ſilver currency. Silver coins are extremely ſcarce from the time of Claudius Gothicus to that of Diocleſian, or from the year 270 to 284; in which ſhort ſpace no fewer than eight emperors reigned. Silver at that time was found moſtly in Spain and the commerce with that country was diſturbed by the uſurpers who aroſe in Gaul: and ſuch were the troubles of the times, that not only the ſilver, but alſo the gold coins of thoſe eight emperors, are extremely ſcarce. There is ſtill, however, ſome ſilver extant of theſe eight emperors; and it is certain, that copper waſhed was never uſed as ſilver currency, but was entirely a diſtinct coinage. Occaſional depravations of ſilver had taken place long before; as Pliny tells us, that Mark Anthony mixed iron with his ſilver denarii; and Mr Pinkerton informs us, that he had ſeeen a denarius of Anthony, which was attracted by a magnet.

21 Ancient braſs.

The ancient braſs coins conſiſt of two kinds: the red or Cyprian, which indeed is no other than copper; and the common yellow braſs. Our author obſerves, that in the Roman coinage braſs was of double the value of copper, and he is of opinion, that it was the ſame among the Greeks; and the latter is the metal moſt commonly made uſe of in the Greek coinage. The Roman ſeſtertii are always of braſs: the middling-ſized kind are partly copper and partly braſs; the former being double the value of the latter, which are the *aſes*.

22 Mixed metals.

Mr Pinkerton next proceeds to give an account of the mixed metals uſed among the Romans. In Britain all kinds of coins made of mixed metal are without heſitation alleged to be forgeries; although it is certain that the variety of mixed metals uſed in coinage was very conſiderable. The moſt valuable mixture was that of gold or ſilver already mentioned, named *electrum*; the ſilver commonly amounting to one-fifth part of the gold made uſe of, or perhaps more. Of this mixture are many of the early coins of Lydia, and ſome other Aſiatic ſtates; alſo thoſe of the kings of the Boſphorus Cimmerius, during the imperial ages of Rome.

23 Corinthian braſs.

Next to the electrum were the coins of Corinthian braſs: but Mr Pinkerton informs us, that not a ſingle coin was ever ſtruck of this metal by the ancients; it having been conſtantly employed only in the fabrication of vaſes or toys. It was in uſe at any rate only for a very ſhort time; being altogether unknown in the days of Pliny the Elder. Our author therefore ridicules thoſe who pretend not only to find out imperial coins of this metal, but to diſcover three kinds of it; *viz.* one in which the gold predominates, another in which the ſilver prevails, and a third where the braſs is moſt conſpicuous. He gives Æneas Vico, one of the moſt ancient writers on medals, as the author of this idea; but whoſe opinions were confuted by one Savot, a writer in the 17th century. Vico mentions a coin of this kind ſtruck under Auguſtus, another of Livia, and a third of Claudius. The miſtake, he is of opinion, aroſe from the circumſtance of the firſt propagator not being able to account for the various

Of what conſtructed

various mixtures and modifications of braſs obſervable in ancient coins of the large ſize; and which in ſo common a metal appear very odd to the moderns. Beſides the authority of Pliny and other antiquaries of more modern date, who all declare that they never ſaw a ſingle medal of Corinthian braſs, or of that metal mixed with ſilver and gold, our author adduces another evidence which he looks upon to be ſuperior to either; *viz.* that thoſe who have given into this ſuppoſition, imagine, that the large pieces called *ſeſtertii*, and others called *dupondiarii*, worth about twopence or a penny, are ſaid to have been compoſed of this precious metal. It is unreaſonable to think, that any proportion of gold or ſilver could have been made uſe of in theſe. The coins ſaid to have been ſtruck upon Corinthian braſs are only done upon a modification of common braſs; of which we know, that in proportion to the quantity of zinc made uſe of in conjunction with the copper, the metal aſſumes a variety of hues. On the authority of Pliny he informs us, that the coins miſtaken for Corinthian braſs were no other than prince's metal.

24 Egyptian ſilver coins

The Egyptian ſilver coins ſtruck under the Roman emperors are at firſt of tolerably pure ſilver; but afterwards degenerate into a mixture of copper and tin with a little ſilver. They are very thick, but many of them are elegantly ſtruck, with uncommon reverſes. There are likewiſe three ſets of braſs coins belonging to this country from the earlieſt times of the Roman emperors there. Some of theſe are of bell-metal or pot-metal; and after the time of Gallienus and Valerian, the coinage of braſs with a ſmall addition of ſilver becomes authoriſed by the ſtate; the coins ſtruck upon it being called *denarii ærei*. Thoſe of lead or copper plated with ſilver have been fabricated by Roman forgers. Some coins of lead, however, have been met with of undoubted antiquity; and an ancient writer informs us that tin-money was coined by Dionyſius; but none has been found. The lead coins of Tigranes king of Armenia, mentioned as genuine by Jobert, and accounted forgeries by Mr Pinkerton and other modern medalliſts. Plautus, however, makes mention of leaden coins, and ſeveral of them have been found; but our author looks upon them to have been chiefly eaſy pieces, ſtruck in order to let the artiſt judge of the progreſs of the dye. Others are the plated kind already mentioned, fabricated by ancient forgers, but having the plating worn off. A great number of leaden coins are mentioned by Ficorini in a work intitled *Piombi Antichi*, in which he ſuppoſed them to have ſerved as tickets for gueſts; and coins of the ſame kind are alſo mentioned by Paſſeri. In the work intitled *Notitia Imperii Romani*, there is mention of coins made of leather, but none of them have ever been found.

Sect. V. *Of Ancient Money.*

In conſidering the different ſizes, values, &c. of the Greek and Roman coins, our author treats of the medals as money; a knowledge of which, he ſays is eſſentially neceſſary to every reader of the claſſics; inſomuch that it may almoſt diſpute the preference with the ſtudies of ancient geography and chronology. Notwithſtanding all that has been written upon the ſubject, however, our author is of opinion, that the ſcience is ſtill in its infancy, in as far as it relates to the real money of the ancients. "The ideal (ſays he), which is indeed the moſt important province of diſcuſſion, has been pretty clearly aſcertained; and we are almoſt as well acquainted with the Attic *mna* or *mina*, and the perplexing progreſs of the Roman *ſeſtertia*, as with our own *pounds*. But with the actual coin of the ancients the caſe is different; and the ignorance even of the learned in this point is wonderful."

25 Knowledge of ancient money imperfect.

Our author now goes on, with great aſperity of language, to particulariſe the ignorant manner in which modern authors have treated the ſubject of medals. "Arbuthnot and Clarke (ſays he) are if poſſible more ignorant of medals than Budæus the very firſt. The latter profeſſes his love of medals, but quotes a conſular coin with the head of Cicero; and looks upon one of the 30 pieces of ſilver, the reward of the treachery of Judas, and which was ſaid to be preſerved among ſome relicts at Paris, to be worthy of reference and commemoration. Arbuthnot, if we may judge from his book, had never ſeen any ancient coins; and Clarke, it is well known, was quite ignorant of them. The latter, with all his labour, ſeems even to have known nothing of the theoretic part of the real ancient money. Indeed Dr Mead's catalogue ſeems to have been almoſt the only *book* on medals which had undergone his peruſal. On the other hand, the ignorance of medalliſts on this ſcore is no leſs profound. To this day they look upon the *didrachms* of Ægina, ſo celebrated in antiquity, as *tridrachms* of Ægium; and upon the early obolus as a braſs coin. In the Roman claſs the large braſs is eſteemed the *as*, while it ſhall be proved that it is the *ſeſtertius*, and worth four *aſſes*. The *denarius* is reckoned at ten aſes even in the imperial times; whereas it only went at that rate for the firſt 90 years after the coinage of ſilver at Rome. The denarius æreus is taken for ſilver currency; with other miſtakes which evince that medalliſts are as ignorant of the theory as the others are of the practice."

26 Money firſt coined in the eaſt.

In his account of the ancient Greek money, Mr Pinkerton obſerves, that the light of ſcience, like that of the ſun, has proceeded from eaſt to weſt. "It is moſt probable (ſays he), that the firſt invention of money aroſe like the other arts and ſciences; and ſpread from thence into the weſtern parts of the world.

27 Its firſt rude ſtate.

In its firſt ſhape it appeared as mere pieces of metal without any ſtated form or impreſſion; in lieu of which, it was regulated by weight. Even down to the Saxon government in England, large ſums were regulated by weight; and in our own times every ſingle piece is weighed in gold; though with regard to ſilver this nicety is not minded, nor indeed does it ſeem practicable. Among the ancients, whoſe commercial tranſactions were leſs important and extenſive than thoſe of the moderns, ſilver was weighed as well as gold; nay even braſs, in ſome caſes.

28 Greek money.

In Greece, large ſums were determined by *mnæ* or *minæ*; and the moſt capital ſums by *talents*. In every country the mina is ſuppoſed to have contained 100 drachmæ or ſmall ſilver coins, of that country, and the talent 60 minæ. The mina is ſuppoſed to be a pound weight of the country to which it belonged. The Attic pound, according to Dr Arbuthnot contained 16 ounces, equal to our avoirdupois pound: but Mr Pinkerton looks upon this as a very abſurd opinion, and accuſes the Doctor of having adopted it merely that he may explain a paſſage in Livy. He is of opinion, that the Attic pound is very nearly the ſame with the pound Troy. The mina of Athens had at firſt 73 drachms; but by Solon it was fixed at 100. The ancient drachm weighed the ſame which it does at preſent in medical weight, *viz.* the eighth part of an ounce. The mina or pound of 12 ounces had conſequently 96 of theſe drachms; but four of them were given to the round ſum to ſupply defects in the alloy; "and indeed (ſays our author), in conſequence of a common practice in all ages and in all countries, of giving ſome addition to a large weight. Thus the pound in weight had but 96 drachms in fact, while the pound in tale had 100; as the Roman libra in weight had but 84 denarii; in tale 100; and as our pound in tale, by an inverſe progreſs, is not a third of our pound in common weight."

29
Of the ancient talents.
Notwithſtanding the very ſevere criticiſm on Dr Arbuthnot juſt mentioned, however, we find our author adopting his account of the *talents* uſed in coinage in ſeveral countries. Thus, according to the Doctor,

The Syrian talent had		15 Attic minæ.
Ptolemaic	-	20
Antiochian	-	60
Eubœan	- -	60
Babylonian	-	70
Larger Attic	-	80
Tyrian	- -	80
Egyptian	-	80
Eginean	-	100
Rhodian	-	100

Notwithſtanding the conceſſion made here by Mr Pinkerton to the Doctor, he tells us, that he very much queſtions this liſt of talents, and that many ancient writers are little to be relied upon. "Writers on this ſubject confeſs, that the numbers in all ancient manuſcrips are the parts moſt ſubject to error, as being almoſt always contracted. They ought to allow that the authors themſelves muſt often be liable to wrong information.

"Herodotus mentions, that King Darius ordered gold to be paid into his treaſury by the Euboic talent, and ſilver by the Babylonian. The Euboic is eſteemed the ſame with that called afterwards the Attic: and as we eſtimate gold by carats, ſo it is natural to ſuppoſe, that the moſt precious metal would be regulated by the moſt minute weight. But I confeſs, I take the Babylonic talent to be the ſame with that of Ægina. Mr Raper has proved the firſt coins of Macedon to be upon the ſtandard of Ægina. Now the early Perſian coins are upon that very ſcale, the largeſt tetradrachms weighing from 420 to 440 grains. Hence it follows, that the Perſian ſilver coins were of the Æginian ſtandard; and the payment was certainly to be made according to the ſtandard of the money. The larger Attic talent was of 80 leſſer minæ; becauſe the larger Attic mina was of 16 ounces. The Alexandrian talent, according to Feſtus, contained 12,000 denarii, being the ſame with that uſed by the Egyptian kings in their coins; and is ſhown by Mr Raper to have been the ſame with the talent of Ægina. Perhaps the whole of the ancient conis of Aſia, Africa, Greece, Magna Grecia, and Sicily, are reducible to three talents or ſtandards. 1. That of Ægina, uſed in moſt of the more ancient ſilver coinages; as would ſeem in even the later Egypt, Carthage, Cyrene, &c. 2. The Attic (being the Aſiatic gold ſtandard, afterwards uſed by Phidon king of Argos in eſtimating gold, and called Euboic from Eubœa, one of the quarters of the city of Argos), uſed in Athens and the greater part of the world as the ſtandard both of gold and ſilver. 3. The Doric or Sicilian talent of 24 nummi, each worth an obolus and an half; whence the talent is eſtimated at ſix Attic drachms or three darics. Theſe weights continued to be the ſtandard of money after it began to be diſtinguiſhed by impreſſion; nay, to the fall of Greece and prevalence of the Roman empire."

30
Coinage originates in Lydia.
Coinage, according to Herodotus, was firſt invented by the Lydians, from whom the Greeks quickly received it. The former could not have received it from the Perſians, whoſe empire did not begin till 570 B. C. though our author ſuppoſes that it might have proceeded from the Syrians, who carried on commerce in very ancient times.

31
Moſt ancient Greek coins deſcribed.
The moſt ancient Greek coins of ſilver have an indented mark upon one ſide, and a tortoiſe upon the other; and thoſe of greateſt antiquity have no letters upon them. Thoſe of later date have AIΓI marked upon them, which medalliſts interpret of Ægium in Achaia; being led into that ſuppoſition by the tortoiſe, which they look upon as the ſure mark of the Peloponneſus. But though our author agrees that the tortoiſe was ſo, he thinks that they are otherwiſe very far wrong in their concluſions. Ægium in Achaia was a place of no conſequence till the times of Aratus and the Achaian league; but there are 11 of theſe coins in Dr Hunter's cabinet, which ſhow that they muſt have been ſtruck in times of the moſt remote antiquity, and that the place where they were ſtruck was rich and flouriſhing at the time. The coins we ſpeak of are not uncommon; but thoſe which have the name AIΓEIΩN at full length, and which may perhaps belong to Ægium in Achaia, are extremely ſcarce; inſomuch that in all Dr Hunter's vaſt collection there are not above one or two. They are likewiſe conſtructed upon a ſcale quite different from all other Grecian money; being of 8, 13, $15\frac{1}{7}$, 90, and about 186 grains: The Grecian drachma at an average is 66 grains; Mr Pinkerton thinks it would have been ſtrange if pieces had been ſtruck of eight-tenths of an obolus, of an obolus and an half, or of a drachma and an half. Ægium being originally an obſcure village, could not be the firſt which coined money; ſo that Mr Pinkerton ſuppoſes the name AIΓI to have ſtood for Ægialus, the ancient name of Sicyon, a wealthy and powerful city; or rather Ægina, the mint of which was much celebrated, and perhaps the moſt ancient in Greece.

Other arguments in favour of theſe coins being derived from Ægina, are drawn from their weight as well as their workmanſhip, which are quite different from thoſe bearing the name of Ægium at full length. The coinage of Ægina is known to have been different from that of the reſt of Greece; inſomuch that its drachm was worth 10 Attic oboli, while the Attic drachm was valued only at ſix. Hence the drachmas

Ancient Money.

mas of Ægina were named by the Greeks παχειαν, or *thick;* a name very applicable to the coins in queſtion. From theſe obſervations, our author is of opinion, that we may even diſtinguiſh the preciſe weight of the ancient coins of Ægina. According to the exact proportion, the drachma of this place ſhould weigh exactly 110 grains; and one of them very much rubbed weighed above 90. The others of larger ſize, which ſeem to be didrachms of Ægina, weigh from 181 to 194 grains; but the latter being the only one he could meet with in good preſervation, it was impoſſible to form any juſt medium. Even in thoſe beſt preſerved, he thinks that ten grains may be allowed for a waſte of the metal in ſo long a time as 2400 years, which would bring the drachma of Ægina near its proper ſtandard. The obolus of Ægina was in proportion to its drachma of ſix oboli. It is the piece of $15\frac{1}{2}$ grains, and 13 when very much rubbed. The hemiobolon is that of eight, and when rubbed ought to weigh ſeven.

32 The drachma the moſt general denomination.

The general denomination of the Greek money is the drachma, or eighth part of an ounce; which to this day is retained in the medical weights, the Grecian coins receiving their names from the weights they bore; though in ſome inſtances the weights received their appellations from the coins. The ſilver drachma, according to Mr Pinkerton, was about nine pence ſterling; and he finds fault with thoſe who make the drachma and denarius both equal to one another, the latter being no more than eight pence. The didrachm of ſilver, according to the ſame calculation, was worth 18d.; but the *tridrachm* occurs very rarely; and Mr Pinkerton is even of opinion, that medalliſts give this name to the didrachm of Ægina. The largeſt of all the Grecian coins is the tetradrachm, which on the Æginean ſtandard is worth five ſhillings; but in thoſe of the other ſtates only four. There are, however, many ſubdiviſions in the ſilver drachma; the higheſt being the tetraobolion or coin of four oboli; being in proportion to the drachma as the groat to a ſixpence, weighing about 44 grains, and being in value about ſixpence. The hemidrachm or triobolion comes next in value, weighing about 33 grains, and worth fourpence halfpenny. The ſilver diobolion, or third of the drachma, weighs about 22 grains, and is worth three pence. The obolus of ſilver weighs about 11 grains, and is worth only three halfpence. There is likewiſe a hemiobolion in ſilver, or half the obolus, of five grains and an half, value three farthings; and another called *tetartobolion dichalcos* or quarter obolus, which is the moſt minute coin yet met with; and by reaſon of its extreme ſmallneſs, weighing only two grains and a quarter, is now very ſcarce: but there is one in the cabinet of Dr Hunter, and ſome more have been lately brought from Athens by Mr Stuart. Some of them are likewiſe met with at Tarentum. It would appear, however, that there were ſome ſtill ſmaller, and of value only three-fourths of a farthing. None of theſe have been met with; and the ſmallneſs of the ſize renders it improbable that any will ever be met with; as the peaſants, who commonly diſcover coins, would probably either not obſerve them at all, or if they did would neglect them as things of no value.

33 Different names of Greek coins.

Many different names have been impoſed on the coins belonging to the different ſtates of Greece: thus Κορη, *the maiden*, was a name often applied to the tetradrachm, and which would ſeem to apply to thoſe of Athens; though there are coins of other cities with the head of Proſerpine, and the word Κορη, to which it would appear more applicable in our author's opinion. Χελωνη, *the ſhell*, was the name of another coin from its type. A Sicilian coin was named Δημαρετιον, from Gelon's wife. A tetradrachm was named Κραταταγους, and had eight ευθειας or hemidrachms. The τροιζηνιον, ſo called from its country Troizene, had Pallas on one ſide and a trident on the reverſe. The hemiobolion was the πελανορ of Lacedemon; and the Κολλυβος is ſuppoſed to have been equal to the Roman ſeſtertius or quarter drachma. The *cyſtophori* were coins with the myſtic cheſt or hamper of Bachus upon them, out of which a ſerpent riſes; and are much celebrated in antiquity. We are told by Livy, that Marcus Acilius, in his triumph over Antiochus and the Etolians, carried 248,000 of them; Cneius Manlius Vulſo in that over Gallo-Græcia had 250,000; and Lucius Emilius Regillus, in his naval triumph over the fleets of Antiochus, had 131,300. Cicero likewiſe mentions his being poſſeſſed of a vaſt ſum in them. The moſt probable opinion concerning them ſeems to be, that they are all ſilver tetradrachms; ſuch as belong to the cities of Apamea and Laodicea in Phrygia; Pergamus in Myſia; Sardis and Tralles in Lydia; and Epheſus; but it is a miſtake to aſcribe any to Crete. Mr Pinkerton thinks it abſurd to imagine that Crete a ſmall iſland, ſhould ſtrike ſuch vaſt numbers of coins; though Cicero mentions his being in poſſeſſion of an immenſe treaſure in them at the time he was governor of Aſia Minor. "It is moſt likely (ſays Mr Pinkerton), that his wealth ſhould be in the coin of the country to which he belonged. But what had theſe triumphs or Cicero's government, to do with Cretan money? But indeed the coins themſelves, as above noticed, eſtabliſh the fact."

34 Coins of Cyzicus.

Another ſet of coins famous in antiquity were thoſe of Cyzicus in Myſia, which were of gold; but they are now almoſt entirely vaniſhed by being recoined in other forms. The Αρυανδικον νομισμα, or *money of Aryandes*, who was made governor of Egypt by Cambyſes, is made mention of by Hyſychius; but none of them, as far as is known, have reached our times. They muſt have been marked with Perſian characters, if with any. The coin of Queen *Philiſtis* is mentioned by the ſame writer, and many of theſe pieces are ſtill extant; but we know not where this queen reigned, nor does there ſeem to be any method of finding it out. Mr Pinkerton inclines to believe, that ſhe preſided over Sicily; and as a confirmation of that ſuppoſition, mentions ſome inſcriptions of ΒΑΣΙΔΙΣΣΑΣ ΦΙΔΙΣΤΙΔΟΣ on the *Gradini* of the theatre at Syracuſe; but which appear not older than the Roman times. Some authors are of opinion, that ſhe reigned in Coſſara or Malta; which our author thinks much more improbable.

35 Athenian coins.

The moſt particular attention with regard to the name. and ſtandard to coins is due thoſe of Athens; and it is remarkable, that moſt of them which have reached us are of a very late period, with the names of magiſtrates inſcribed upon them. Some of theſe bear the name of Mithridates; and few are older than the era of that prince; who, it is well known, took the city of Athens in his war with the Romans. I ſuſpect (ſays Mr Pinkerton) that no Athenian coins of ſilver are poſterior to Sylla's infamous deſtruction of that city: an event the more remarkable, as Salluſt tells us, that Sylla was learned in Greek. Indeed Caligula, Nero, and moſt of the peſts of ſociety, have been learned men, in ſpite of a noted axiom of Ovid,

> *Sed ingenuas didiciſſe fideliter artes*
> *Emollit mores, nec ſinit eſſe feros.*

It is ſtill more remarkable, that the fabric of Athenian coins is almoſt univerſally very rude: a ſingular circumſtance, if we reflect how much the arts flouriſhed there. It can only be accounted for from the excellence of their artiſts being ſuch as to occaſion all the good ones to be called into other countries, and none but the bad left at home. In like manner, the coins ſtruck at Rome in the imperial times are excellent, as being done by the beſt Greek artiſts; while thoſe of Greece, though famous at that time for producing miraculous artiſts, are during that period commonly of very mean execution. The opulence of Athens in her days of glory was very great; owing in an eminent degree to her rich commerce with the kingdoms on the Euxine ſea; carried on chiefly from Delos, which belonged to Athens, and was the grand centre of that trade." Hence it has become matter of ſurpriſe to Neumann, that when there are ſo many coins of Mycene, an iſland even proverbially poor, there ſhould be none of Delos. But Mr Pinkerton accounts for this from Mycene's being a free ſtate, and Delos ſubject to Athens. "It may be well ſuppoſed (ſays he), that Athens had a mint at Delos; and ſuch Athenian coins as have ſymbols of Apollo, Diana, or Latona, were ſtruck in this iſland."

36 Greek copper money. The copper money of the Greeks is next in antiquity to the ſilver. Mr Pinkerton is of opinion, that it was not uſed at Athens till the 26th year of the Peloponneſian war; about 404 years before Chriſt, and 300 after ſilver was firſt coined there. The firſt copper coins were thoſe of Gelo of Syracuſe, about 490 B, C.

37 Of the chalcos. The chalcos of braſs, of which eight went to the ſilver obolus, ſeems to have been the firſt kind of Greek coin. At firſt it was looked upon of ſo little conſequence, that it became proverbial; and to ſay that a thing was not worth a *chalcos*, was equivalent to ſaying that it was worth nothing. As the Greeks became poor, however, even this diminutive coin was ſubdivided into two, four, nay eight λεπτα or ſmall coins; but our author cenſures very ſeverely thoſe who have given an account of theſe diviſions. "Pollux and Suidas, copying from him (ſays he), tells us, that there were ſeven lepta to one chalcos; a number the moſt unlikely that can be, from indiviſibility and incapacity of proportion.

"Pollux lived in the time of Commodus, ſo was too late to be of the ſmalleſt authority: Suidas is four or five centuries later, and out of the queſtion. Pliny tells us, that there were ten chalci to the obolus; Diodorus and Cleopatra that there were ſix; Iſidorus ſays there were four: and if ſuch writers differ about the larger denomination, we may well imagine that the ſmaller equally varied in different ſtates; an idea ſupported by theſe undeniable witneſſes the coins which remain. Moſt of the Greek copper-coin which has reached our times conſiſts of Chalci; the lepta being ſo ſmall as to be much more liable to be loſt." In Dr Hunter's cabinet, however, there are ſeveral of the dilepta of Athens; and from being ſtamped with the repreſentation of two owls, ſeem to be the ſame with the ſilver diobolus: "a circumſtance (ſays Mr Pinkerton) of itſelf ſufficient to confute Pollux; for a dilepton can form no part of ſeven; a number indeed which never appeared in any coinage of the ſame metals, and is contradictory to common ſenſe. It may be obſerved, that the whole braſs coins of Athens publiſhed by Dr Combe are reducible to four ſizes, which may be the *lepton*, *dilepton*, *tetralepton* or *hemichalcos*, and *chalcos*. The firſt is not above the ſize of one of king James I.'s farthing tokens; the laſt about that of our common farthing." The *lepta* was alſo called Κερμα, as being change for the poor. The Κιδαβος, perhaps ſo called from the figure of a wolf upon it, was the coin of a particular ſtate, and if of braſs muſt have weighed three chalci. The other names of the copper-coins of Greece are but little known. Lycurgus ordered iron money to be coined at Sparta; but ſo periſhable is this metal, that none of that kind of money has reached our times.

38 Lepton, dilepton, &c.

After the conqueſt of Greece by the Romans, moſt of the coins of that country diminiſhed very much in their value, the gold coinage being totally diſcontinued; though ſome of the barbarous kings who uſed the Greek character were permitted to coin gold, but they uſed the Roman model; and the ſtandard uſed by the few cities in Aſia who ſpoke the Greek language in the times of the emperors is entirely unknown. Copper ſeems to have been the only metal coined at that time by the Greeks themſelves; and that upon the Roman ſtandard, then univerſal through the empire, that there might be no impediment to the circulation of currency. They retained, however, ſome of their own terms, uſing them along with thoſe of the Romans. The *aſſarion* or *aſſarium* of Rome, the name of the diminiſhed *as*, being 16 to the drachma or denarius, the obolus was ſo much diminiſhed in value as to be ſtruck in braſs not much larger than the old chalcus, and valued at between two and three aſſaria; which was indeed its ancient rate as to the drachma. This appears from the copper coins of Chios, which have their names marked upon them. The braſs obolus, at firſt equal in ſize to the Roman ſeſtertius or large braſs, leſſens by degrees to about the ſize of a ſilver drachma. From the badneſs of the imperial coinage in Greece alſo, it appears that braſs was very ſcarce in that country, as well as in all the cities uſing the Greek characters; being found moſtly in the weſtern countries of the Roman empire. The time of this declenſion in ſize of the Greek coins is by Mr Pinkerton ſuppoſed to have been from Auguſtus down to Gallienus. He is of opinion, however, that the copper obolus, at firſt above the ſize of large braſs, was uſed in Greece about the time of its firſt ſubjection to Rome; and that the lepta ceaſing, the chalci came in their room, with the dichalcus and the hemiobolion of braſs.

39 Era of the declenſion of the Greek coinage.

With

40
Gold coins of Greece.

With reſpect to the gold coins of the Greeks, Mr Pinkerton is of opinion that none of that metal was coined before the time of Philip of Macedon, as none have reached our times prior to the reign of that monarch. From a paſſage in Thucydides our author concludes, that in the beginning of the Peloponneſian war the Athenians had no gold coin. Mentioning the treaſure in the Acripolis or citadel of Athens, at the commencement of that war, the hiſtorian mentions ſilver coin, and gold and ſilver in bullion: and had any of the gold been in coin, he would certainly have mentioned it. Philip began his reign about 68 years after the beginning of the Peloponneſian war; and we can ſcarce ſuppoſe that any city would have preceded the elegant and wealthy Athens in the coining of gold.

41
Gold coined early in Sicily.

Notwithſtanding, however, this deficiency of gold coin among the Greeks, it is certain that the coinage of gold had taken place in Sicily long before; as we have gold coins of Gelo about 491 B. C. of Hiero I. 478, and of Dionyſius I. in 404, all uſing the Greek characters; though not to be ranked among the gold coins of Greece, as Philip cauſed his to be. Gold coins of Syracuſe even appear of the third claſs of antiquity, or with an indented ſquare, and a ſmall figure in one of its ſegments. Gold coins were uſed in the cities of Brettium, Tarentum, and throughout Magna Grecia; alſo in Panticapæa in Thrace, and likewiſe Coſa in that country; but not in Tuſcany, as is commonly believed, though Neumann proves that they are ſtruck by Brutus, and are unqueſtionably as ancient as the Greek coins. The Thebans and Athenians probably coined the firſt gold after Philip had ſet them the example, and when they were attempting to reſiſt the projects of that enterpriſing monarch. The Ætolians probably coined their gold during the time of their greateſt power about a century after Philip, and when they were combating the power of Aratus and the Achæan league. "There is (ſays Mr Pinkerton) but one ημιχρυσος of Thebes, much worn, in Dr Hunter's cabinet, and weighing but 59 grains; and perhaps not above two or three χρυσοι or gold didrachms of Athens in the world; one of which is alſo in the collection of Dr Hunter, and weighs 132½ grains. It appears to be more modern than the reign of Philip. That monarch having got poſſeſſion of the mines of Philippi in Thrace, improved them ſo much, that they produced him annually above a thouſand talents of gold, or 2,880,000l. of Sterling money. From this gold the firſt coins named from the monarch *Philippi* were ſtruck. They were marked with his portrait; and for many ages after were ſo numerous, that they were common in the Roman empire: whence the name *Philippi* became at length common to gold, ſilver, and at laſt even braſs coins of their ſize. Even in the time of Philip gold was very ſcarce in Greece; but after the Phocians had plundered the temple of Delphos, this precious metal, which had been valued as gems, and conſecrated only to the decoration of the temples of the gods, began to be known among the Greeks. The comparative value of gold and ſilver, however, ſeem to have been at that time very different from what they are now. Herodotus values gold at 13 times its weight in ſilver; Plato in his Hipparchus at 12; and even the low value of 10 to 1. ſeems to have been the ſtated value in Greece, tho' in Rome the plenty of ſilver from the Spaniſh mines made the value of gold to be much higher; and there is no reaſon to think that it was ever valued in that city at leſs than 12 times its weight in ſilver. The *Philippus*, χρυσος, gold piece, or *ſtater*, is a didrachm, and is the moſt common of all the ancient coins. Mr Pinkerton is of opinion that it went for 20 ſilver drachms on its firſt appearance; but in latter times for 25 Greek drachmæ or Roman denarii. There are proofs of the Philippi being didrachms, both from the writings of ancient authors and from numbers of the coins themſelves, which remain to this day; and that the χρυσος, or principal gold coin of Greece, was of the ſame weight, is alſo evident from ancient writings. It was anciently worth about 15s. but valuing gold now at the medium price of 4l. per ounce, it is worth about 20s. The ημιχρυσος, or half the former coin, ſcarcely occurs of the coinage of Philip and Alexander, though it does of Hiero I. of Syracuſe and of king Pyrrhus. It paſſed for ten ſilver drachmas, and was valued only at 7s. 6. though now worth 10s. There was another diviſion of this kind worth about 5s. There were beſides ſome leſſer diviſions of gold coins, which could not be worth above two drachmas. Theſe were coined in Cyrene; and there were beſides ſeveral old gold coins of Aſia Minor, the value of which is now unknown. Our author ſuppoſes that they were coined not with relation to their weight as parts of the drachma, but merely to make them correſpond with ſo many ſilver pieces as was neceſſary. There are alſo larger coins than the χρυσος, the διχρυσος of Alexander and Lyſimachus being double its value. Some others are met with by Lyſimachus, Antiochus III. and ſome of the Egyptian monarchs, weighing four times the χρυσος, and now worth about 4l. ſterling. Some weigh even more: but this our author ſuppoſes owing to the gold being leſs pure.

42
Roman money.

In Rome, as well as in Greece, the money was at firſt eſtimated by weight; and the firſt metal coined by that people was copper, ſilver being long unknown in Rome; nor is it certainly known that any ſilver has ever been found in the Italian mines. In Rome the firſt valuation of money was by the *libra gravis æris*, or pound of heavy braſs: and in the progreſs of their conqueſts, the little ſilver and gold that came in their way was regulated by the ſame ſtandard, as appears from the ſtory of Brennus. The weights made uſe of were the ſame with thoſe which continue to this day. The pound conſiſted of 12 ounces of 458 grains each; but the pound by which the money was weighed appears to have conſiſted only of 420 grains to the ounce, or to have contained in all 5040 grains. This became the ſtandard of copper; and when ſilver came to be coined, ſeven denarii went to the ounce as eight drachms did in Greece. Gold was regulated by the *ſcriptulum* or *ſcrupulum*, the third part of a denarius, and by the larger weights juſt mentioned. The number 10 was at firſt uſed by the Romans in counting their money; but finding afterwards that a ſmaller number was more convenient, they divided it into quarters; and as the quarter of 10 is 2½, they for this reaſon beſtowed upon it the name of *ſeſtertius* or "half the third;" to expreſs that it was two of any weights, meaſures, &c. and half a third; whence the ſeſtertius

43
Of the Roman pound

44
Seſtertius, as, &c.

came at laſt to be the grand eſtimate of Roman money. The *as* being at firſt the largeſt, and indeed the only Roman coin, the word *ſeſtertius* means *ſeſtertius as*, or "two aſes and an half." On the firſt coining of ſilver, the denarius of ten aſes was ſtruck in the moſt common and convenient denary diviſion of money, or that by tens; the ſeſtertius being of courſe two aſes and an half. But the denarius being afterwards eſtimated at 16 aſes, the name ſeſtertius was ſtill applied to a quarter of the denarius, though it now contained four aſes. The term *ſeſtertius* was applied to all ſums not exceeding 1000 ſeſtertii, or L. 8 : 6 : 8; but for greater ſums the mode of the ſeſtertius was likewiſe altered, though not to exclude the former. Very large ſums of money were eſtimated by the hundred weight of braſs; for the Romans were at firſt unacquainted with the talent. The hundred weight, by way of eminence, was diſtinguiſhed by the name of *pondus*, and *ſeſtertium pondus* became a phraſe for two hundred weight and an half. Mr Pinkerton is of opinion, that we may value the *as libralis* of ancient Rome at about eight-pence Engliſh. Eſtimating the *as* therefore at a pound weight, the *ſeſtertium pondus* was equal to 1000 *ſeſtertii*, or L. 8 : 6 : 8; and by a coincidence which our author ſuppoſes to have been the effect of deſign, as ſoon as the ſilver coinage appeared, the *ſeſtertium centum denariorum* was always equal to L. 8. 6s. 8d. alſo. The word *ſeſtertium* itſelf, however, ſeems to have been unknown prior to the coinage of ſilver money at Rome: the *pondera gravis æris* being ſufficient before that time for all the purpoſes of a ſtate in which money was ſo ſcarce. But however this may be the *pondus* or hundred weight of braſs was preciſely worth 100 denarii, or a pound of ſilver. As the great ſeſtertium was always valued at 1000 of the ſmaller, or L. 8 : 6 : 8, we never find one ſeſtertium mentioned in authors, but two, three, or more: ten thouſand of them being equal to L. 8,333,333 : 6 : 8.

45 Whence the Romans derived their coinage.

The ſtates from which the Romans may be ſuppoſed firſt to have derived their coinage, were the Etruſcans and the Greek colonies in Magna Grecia and Sicily. Joſeph Scaliger, Gronovius, &c. contend that it was from the Sicilians that the Romans firſt derived their knowledge of money; but Mr Pinkerton argues that it was from the Etruſcans. In confirmation of his opinion he appeals to the ſtate of the Roman territory in the time of Servius Tullius, who is looked upon to have been the firſt who coined money at Rome. At that time the whole Roman dominion did not extend beyond ten miles round the city; and was entirely ſurrounded by the Etruſcan and Latin ſtates; Cuma being the next Greek colony to it that was of any conſequence, and which was in the neighbourhood of Naples, at about the diſtance of 150 miles. Our author aſks, Is it reaſonable to think that the Romans received the uſe of money from the Etruſcans and Latins who were their neighbours, or from the Greeks, who were at a diſtance, and at that time, as far as appears from their hiſtory, abſolutely unknown to them? "If this argument (adds he) is ſtrong with regard to the neareſt Grecian colonies, what muſt it be with reſpect to Sicily, an iſland 300 miles diſtant from Rome, where it was not known, at that time, if a boat went by land or water?" Arguments, however, for this opinion, have been derived from the ſimilarity betwixt the Sicilian and Roman coins; which Mr Pinkerton now proceeds to examine. The Greek pound in Sicily was called λιτρα, and conſiſted, like the Roman, of 12 ουγκιαι, or ounces; and Mr Pinkerton grants that the Roman *libra* was derived from the Greek λιτρα, but denies that the *as*, or libra, a coin, was from Sicilian model. The Sicilians had indeed a coin named λιτρα; but it was of ſilver, and of equal value to the Eginean ſtandard, ten of which went to the Sicilian δεκαλιτρον. He differs from Gronovius, that the ſtandard of Ægina was uſed at Corinth, and of courſe at Syracuſe; as it appears from Ariſtotle, that the Sicilians had a talent or ſtandard of their own. The Sicilian obolus or λιτρα contained alſo 12 ounces or *chalci*, ſo named at firſt becauſe they weighed an ounce weight; but the ουγκιαι of Hiero weigh more than a troy ounce; and the braſs coins of Agrigentum are marked with cyphers as far as ſix; the largeſt weighing only 186 grains, or about one third of the primitive ounce. Our author denies that even the Roman denarius took its riſe from the Sicilian δεκαλιτρον, as many authors aſſert. Were this the caſe, it would have weighed 180 grains; whereas the Roman denarii are not above the third part of the quantity.

46 Origin of the Sicilian coins.

From all theſe conſiderations, our author is of opinion that the Sicilians borrowed the diviſion of their λιτρα from the Etruſcans, or poſſibly from the Romans themſelves; which our author thinks is more probable than that the Romans had it from Sicily. The ſtrongeſt argument, however, againſt the Roman coinage being borrowed from the Sicilian is, that though great numbers of Sicilian coins are to be found in the cabinets of medalliſts, yet none of them reſemble the *as libralis* of the Romans in any degree. In moſt cabinets alſo there are Etruſcan coins upon the exact ſcale of the *as libralis*, and ſeveral of its diviſions; from whence Mr Pinkerton concludes, that "theſe, and theſe alone, muſt have afforded a pattern to the primitive Roman coinage." The Etruſcans were a colony from Lydia, to which country Herodotus aſcribes the firſt invention of coinage." Thoſe coloniſts (ſays Mr Pinkerton), upon looking round their ſettlements, and finding that *no* ſilver was to be had, and *much leſs* gold," ſupplied the mercantile medium with copper to which the caſe of Sweden is very ſimilar, which, as late as the laſt century had copper coins of ſuch magnitude, that wheel-barrows were uſed to carry off a ſum not very conſiderable.

47 Of the moſt ancient Roman coins.

Some coins are found which exceed the *as libralis* in weight; and theſe are ſuppoſed to be prior to the time of Servius Tullius. Some of them are met with of 34 and of 53 Roman ounces: having upon one ſide the figure of a bull rudely impreſſed, and upon the other the bones of a fiſh. They are moſt commonly found at Tudder, or Tudertum in Umbria; but they appear always broken at one end; ſo that Mr Pinkerton is of opinion that perhaps ſome might be ſtruck of the decuſſis form, or weighing ten pounds. Theſe pieces, in our author's opinion, make it evident, that the Romans derived their large braſs coins from the Etruſcans and the neighbouring ſtates; they are all caſt in moulds; and the greater part of them appear much more ancient than the Roman aſes, even ſuch as are of the greateſt antiquity.

Mr Pinkerton agrees with Sir Iſaac Newton as to the time that Servius Tullius reigned in Rome, which he ſuppoſes to be about 460 B. C. His coinage ſeems to have been confined to the as, or piece of braſs having the impreſſion of Janus on the one ſide and the prow of a ſhip on the other, becauſe Janus arrived in Italy by ſea. Varro, however, informs us, that the very firſt coins of Tullius had the figure of a bull, or other cattle upon them, like the Etruſcan coins, of which they were imitations. Thoſe with the figure of Janus and the prow of a ſhip upon them may be ſuppoſed firſt to have appeared about 400 years B. C. but, in a ſhort time, various ſubdiviſions of the as were coined. The *ſemis* or half is commonly ſtamped with the head of Jupiter laureated; the *triens* or third, having four cyphers, as being originally of four ounces weight, has the head of Minerva; the *quadrans* or quarter, marked with three cyphers, has the head of Hercules wrapt in the lion's ſkin; the *ſextans* or ſixth, having only two cyphers, is marked with the head of Mercury with a cap and wings; while the *uncia* having only one cypher, is marked with the head of Rome. All theſe coins appear to have been caſt in moulds, by a conſiderable number at a time: and in the Britiſh muſeum there are four of them all united together as taken out of the mould in which perhaps dozens were caſt together. In proceſs of time, however, the ſmaller diviſions were ſtruck inſtead of being caſt; but the larger ſtill continued to be caſt until the as fell to two ounces. Even after this time it was ſtill called *libra*, and accounted a pound of copper; though there were now larger denominations of it coined, ſuch as the *biſſas* or double as: *treſſis* and *quadruſſis* of three and four aſes; nay as far as *decuſſis* or ten aſes, marked X. Olivieri mentions one in his own cabinet weighing upwards of 25 ounces, and caſt when the as was about three ounces weight. There is likewiſe in the Muſæum Etruſcum a decuſſis of 40 Roman ounces, caſt when the as was at four ounces. There was likewiſe a curious decuſſis in the Jeſuit's library at Rome, for which an Engliſh medalliſt offered 20 l.; but it was ſeized by the Pope along with every other thing belonging to the ſociety.

48 Subdiviſions of the as.

49 Larger denominations of it ſtruck.

50 Decreaſe of the as in weight.

Mr Pinkerton conteſts the opinion of Pliny that the as continued of a pound weight till the end of the firſt Punic war. His opinion (he ſays) is confuted by the coins which ſtill remain; and it appears probable to him that the as decreaſed gradually in weight; and, from one or two of the pieces which ſtill exiſt, he ſeems to think that the decreaſe was ſlow, as from a pound to eleven ounces, then to ten, nine, &c.; but neither the as nor its parts were ever correctly ſized. During the time of the ſecond Punic war, when the Romans were ſore preſſed by Hannibal, the as was reduced to a ſingle ounce. It is ſaid to have taken place in the 215th year before our era, being about 36 years after the former change. This as libralis, with the face of Janus upon it, is the form moſt commonly met with previous to its being reduced to two ounces. Our author ſuppoſes that the as libralis continued for at leaſt a century and an half after the coinage of Tullus, down to 300 B. C. about the year of Rome 452, between which and the 502d year of Rome a gradual diminution of the as to two ounces muſt have taken place. The following table of the dates of the Roman coinage is given by Mr Pinkerton.

The libralis, coined by Tullus with the figures of oxen, &c. about 167 years after the building of Rome, according to Sir Iſaac Newton, or about the year before Chriſt.	460
As libralis with Janus and the prow of a ſhip	400
As of ten ounces - - - -	300
Eight - - - -	290
Six - - - -	280
Four - - - -	270
Three - - -	260
Two, according to Pliny - -	250
One, according to the ſame author -	214

About 175 B. C. alſo, we are informed by Pliny, that the as was reduced to half an ounce by the Papyrian law, at which it continued till the time of Pliny himſelf, and long after.

51 Coins on the Greek ſcale marked as Roman.

After the Romans began to have an intercourſe with Greece, a variety of elegant figures appear upon the parts of the as, though not on the as itſelf till after the time of Sylla. Towards the latter end of the republic alſo, *dupondii*, or double aſes, were coined, together with the ſeſtertii ærei, which came in place of the *quadruſſes*, when the denarius began to be reckoned at 16 aſes; probably at the time the latter was reduced to half an ounce. In ſome inſtances it is to be obſerved, that the Romans accommodated their coins to the country where their army was ſtationed; whence we have many coins marked as Roman, which have been coined in Magna Grecia and Sicily, and are evidently upon the Greek ſcale and not the Roman ſcale. In the latter part of the republican times, alſo, the types begin to vary; ſo that we have a braſs coin ſuppoſed to be ſtruck by Sextus Pompeius in Sicily, having upon it a double head of that warrior, repreſenting a Janus. Mr Pinkerton ſuppoſes it to have been a dupondius; which indeed appears to be the caſe from the double head. This coin is of copper, and ſtill weighs an ounce, notwithſtanding its antiquity.

52 Of the ſeſtertius.

The largeſt imperial copper coin was the ſeſtertius, a piece worth about two-pence Sterling money. Mr Pinkerton cenſures ſeverely the opinion of other medalliſts, all of whom ſay that the ſeſtertius was of ſilver. "In fact (ſays he), it would be as rational in any antiquary, a thouſand years hence, to contend that the halfpenny and farthing are of ſilver, becauſe they were ſo in the reign of Henry VIII." In confirmation of his own opinion, he quotes the following paſſage from Pliny: "The greateſt glory of braſs is now due to the Marian, called alſo that of Cordova. This, after the Livian, moſt abſorbs the lapis calaminaris, and imitates the goodneſs of native orichalcum in our ſeſtertii and dupondiarii, the aſes being contented with their own copper." Gronovius confeſſes that he does not know what to make of this paſſage, and that it cauſes him heſitate in his opinion. The *Livian* mine mentioned here by Pliny, is ſuppoſed to have got its name from *Livia* the wife of Auguſtus; and it is probable that the pieces marked with her portrait, intitled JUSTITIA, SALUS, VIRTUS, &c. were dupondii from this very mine, the metal being exceedingly fine, and of the kind named *Corinthian braſs* by the ancient medalliſts. "Perhaps, (ſays Mr Pinkerton) the mine received its name from this very circumſtance of her coins being ſtruck in the metal taken from it."

53 Coinage of yellow braſs.

No change took place in the Roman coinage from the time that the as fell to half an ounce to the days of Pliny; but Mr Pinkerton obſerves, that before the time of Julius Cæſar yellow braſs began to be uſed, and was always looked upon to be double the value of Cyprian or red copper. There are but few coins in large braſs immediately before Julius Cæſar, or even belonging to that emperor; but from the time of Auguſtus downward, the large coins are all found of braſs, and not one of them copper. The largeſt of what are called the middle ſize are all of yellow braſs; and the next ſize, which is the as, and weighs half an ounce, is univerſally copper. What the ancients named *orichalcum*, or what we call *braſs*, was always looked upon to be greatly ſuperior in value to the æs cyprium. Procopius, ſpeaking of a ſtatue of Juſtinian, tells us, that braſs inferior in colour to gold is almoſt equal in value to ſilver. The mines of native braſs were very few in number, and were owing entirely to the ſingular combination of copper and lapis calaminaris in the bowels of the earth, which very ſeldom occurs, and the ancients were far from being well acquainted with the method of combining theſe two bodies artificially; ſo that yellow braſs was always eſteemed at double the value of copper: and hence, in the ancient coinages, the braſs and copper pieces were kept as diſtinct as thoſe of gold and ſilver.

Mr Pinkerton challenges to himſelf the diſcovery that the imperial ſeſtertius was of braſs; and is at conſiderable pains to bring proofs of it. Beſides the teſtimony of Pliny, which of itſelf would be deciſive, this is ſupported by the ſtrongeſt collateral evidence of other authors. From a paſſage in Julius Africanus, who wrote the Ιατρικα, or *Treatiſe on Medicine*, it appears that the nummus, or ſeſtertius, weighed an ounce, and of conſequence that it could not be ſilver but braſs; and all the large imperial Roman coins weigh an ounce. We know not the age in which Julius Africanus lived; but as he makes the denarius to contain 16 aſes, he muſt have been before the age of Gallienus, when it had 60. Gronovius ſuppoſes him to have been the ſame mentioned by Euſebius. This author ſpeaks of a Julius Africanus who lived in the time of Heliogabulus, and whom Mr Pinkerton ſuppoſes to have been the ſame with him abovementioned.

54 Diminution of the ſeſtertius.

The ſeſtertius underwent no change till the time of Alexander Severus, when it was diminiſhed by one third of its weight. Trajanus Decius was the firſt who coined double ſeſtertii, or quinarii, of braſs; but from the time of Trebonianus Gallus to that of Gallienus, when the firſt braſs ceaſes, the ſeſtertius does not weigh above the third part of an ounce: the larger coins are accounted double ſeſtertii; and after the time of Gallienus it totally vaniſhes. In the time of Valerian and Gallienus we find a new kind of coinage, mentioned by the name of *denarii æris*, or *Philippi ærei.* Two ſizes of denarii began to be uſed in the time of Caracalla; the larger of ſix ſeſtertii, or 24 aſſaria; the ſmaller of four ſeſtertii, or 16 aſſaria as uſual. In the time of Pupienus, the latter was reduced to ſuch a ſmall ſize as not to weigh more than 36 grains; though in Caracalla's time it weighed 56. After the time of Gordian III. the ſmaller coin fell into diſuſe, as breeding confuſion. The larger denarius of ſix ſeſtertii, though diminiſhed at laſt to the ſize of the early denarius, ſtill retained its value of ſix ſeſtertii, or 24 aſſaria. The *Philippus æreus* came at length in place of the ſeſtertius. It was alſo called *denarius*; from which we may learn not only their ſize, but that they were in value ten aſſaria as the firſt denarius. In the reign of Diocleſian, the place of the ſeſtertius was ſupplied by the *follis*, that emperor having reſtored the ſilver coin to its purity, and likewiſe given this form to the copper; but it would ſeem that this reſtoration of the coinage only took place towards the end of his reign; whence we have but few of his ſilver coins, and ſtill fewer of the *folles*, though the *denarii ærei* continued quite common down to the time of Conſtantine. The follis of Diocleſian ſeems to have weighed above half an ounce; and Mr Pinkerton is of opinion, that Diocleſian deſigned this coin to ſupply the place of the denarius æreus; which of courſe was worth ten aſſariæ, and ſix of them went to the ſilver denarius. From this time the aſſarium diminiſhes to the ſize of 30 grains; and ſoon after the follis appeared, the denarius æreus was entirely dropped, the former having gradually ſupplied its place. Some mints appear to have retained the uſe of the denarius longer than others; and in ſome the change was preceded, and gradually brought in by waſhing the follis with ſilver or tin, as the denarius had formerly been. Pieces of this kind occur in the times of Diocleſian, Maximian I. and II. and Conſtantius I.; that is, for about ten years after the follis made its appearance. Some countries, however, retained the denarius æreus; others the follis; and ſome had a medium betwixt the two, or the follis waſhed in imitation of the denarius.

55 New coinage introduced by Conſtantine I.

Towards the end of the reign of Conſtantine I. a new coinage was introduced throughout the whole empire. The follis coined by this prince was of half an ounce weight; 24 of them going to the milliarenſis, or larger ſilver coin. The word *follis* ſignifies alſo a purſe, in which ſenſe we ſometimes find it mentioned in the Byzantine hiſtory. The common follis of ſilver, when it occurs by itſelf, means a purſe of 250 milliarenſes, as the ſeſtertium was 250 denarii; and by a law of Conſtantine I. every man paid to the ſtate a follis or purſe according to his income. The method of counting by purſes continues in Turkey to this day.

56 Of the dupondius.

The *dupondius* was only half the value of the ſeſtertius, or about one penny Sterling; and before the yellow braſs appeared it ſeems to have been ſtruck upon copper, and double the ſize of the as. There are ſome of this coin, ſtruck in the time of Julius Cæſar, in yellow braſs, weighing half an ounce, with a head of Venus Victrix upon one ſide; on the reverſe, a female figure, with ſerpents at her feet: while others have a Victory on the reverſe, with Q. Oppius Pr. After the time of Auguſtus, the dupondius was ſtruck in yellow braſs; which Pliny tells us was alſo the caſe in his time. The word dupondiarius ſeems to have been uſed by Pliny, and adopted, not to expreſs that the coin was *dupondius*, but that it was of dupondiary value. Neither was the former word confined to ſignify double weight, but was uſed alſo for double length or meaſure, as in the inſtance of *dupondius pes*, or two feet, &c. In the imperial times, therefore, *dupondius* was uſed, not to ſignify a coin of double the weight of the as, but of double the value. It was one of the moſt common of the Roman coins; and ſeems to have been very common even in Conſtantinople. In the time of Juſtinian, it ſeems there was a cuſtom of nicknaming young ſtudents of the law *dupondii*, againſt which the emperor made a law; but it is not known what gave riſe to the name. The dupondius, though of the ſame ſize with the as, is commonly of finer workmanſhip, the metal being greatly ſuperior in value. It continues to be of yellow braſs, as well as the ſeſtertius, to the time of Gallienus; but the as is always of copper.

57 Of the aſſarium.

The imperial as, or *aſſarium*, was worth only an halfpenny. At firſt it weighed half an ounce, and was always of copper till the time of Gallienus, when it was made of braſs, and weighed only the eight part of an ounce. From the time of Gallienus to that of Diocleſian, it continued to diminiſh ſtill more, the ſize being then twenty to an ounce. This was the ſame with the lepta, or ſmalleſt coins but the *νουμια*, which weighed only ten grains.

58 Parts of the as,

The parts of the as occur but ſeldom; which may, indeed, be well expected, conſidering the low value of it; though there ſtill occur ſome of thoſe called ſemis, triens, quadrans, ſextans, and uncia, coined in the times of Nero and Domitian. There is no ſmall braſs from the time of Pertinax to that of Gallienus, excepting that of Trajanus Decius; but in the time of Gallienus it becomes extremely common; and the coins of ſmall braſs, as well as the larger, are always marked S. C. ſuch as want it being univerſally accounted forgeries, and were plated with ſilver, though the plating be now worn off. The ſmall pieces ſtruck for ſlaves during the time of the ſaturnalia muſt alſo be diſtinguiſhed from the parts of the as. The S. C. upon theſe moſt probably ſignifies *Saturni Conſulto*, and were ſtruck in ridicule of the true coins, as the ſlaves on that occaſion had every privilege of irony.

59 Of the ſmalleſt Roman coins.

The ſeſtertius diminiſhes from Pertinax to Gallienus ſo faſt that no parts of the as are ſtruck, itſelf being ſo ſmall. Trajanus Decius, indeed, coined ſome ſmall pieces, which went for the ſemis of the time. The ſmall braſs coins under Gallienus were called aſſaria, ſixty of which went to the ſilver denarius. They are about the ſize of the denarius, and ſome of them occur of the coinage of Gallus and his family, of half that ſize, which appear to have been ſtruck during the latter part of his reign, when the aſſarium was diminiſhed to a ſtill ſmaller ſize. It is probable, however, that ſome of theſe very ſmall coins had been ſtruck in all ages of the empire, in order to ſcatter among the people on ſolemn occaſions.

60 Of the miſſilia,

Mr Pinkerton is of opinion that they are the *miſſilia*, though moſt other medalliſts think that they were medallions. "But if ſo (ſays our author), they were certainly called *miſſilia a non mittendo*; for it would be odd if fine medallions were ſcattered among the mob. It is a common cuſtom juſt now to ſtrike counters to ſcatter among the populace on ſuch occaſions, while medals are given to peers of the kingdom; and we may very juſtly reaſon from analogy on this occaſion."

The *aſſarion* or *lepton* of the Conſtantinopolitan empire was, as we have already obſerved, one of the ſmalleſt coins known in antiquity, weighing no more than 20 grains; and the *noumia* were the very ſmalleſt which have reached our times. being only one-half of the former. By reaſon of their extreme ſmallneſs, they are very ſcarce; but Mr Pinkerton informs us, that he has in his poſſeſſion a fine one of Theodoſius II. which has on it the emperor's head in profile. Theodoſius P. F. AV.; on the reverſe a wreath, having in the centre VOT. XX.: MULT. XXX.

61 Coins of the lower empire.

The principal coin of the lower empire was the follis, which was divided into an half and quarter, named ϑμισοφολλος and τεταρτον; the latter of which is ſhown by Du Cange to have been a ſmall braſs coin, as the other is ſuppoſed to have been by Mr Pinkerton.—Beſides theſe, the follis was divided into 8 oboli, 16 aſſaria or lepta, and 32 noumia, though in common computation it contained 40 of theſe laſt. This coin, notwithſtanding ſo many diviſions, was of no more value than an halfpenny.

Mr Pinkerton controverts an opinion, common among medalliſts, that the largeſt braſs coin or follis of the lower empire had 40 ſmall coins, expreſſed by the letter M upon it; the next had 30, expreſſed by the letter Λ; the half by the letter K; and the quarter marked I, which contained only 10. Mr. Pinkerton informs us, that he has three coins of Anaſtaſius, all marked M in large: one of them weighs more than half an ounce; the ſecond 40 grains leſs; and the third of 160 grains, or one-third of an ounce; but the ſize is ſo very unequal, that the laſt, which is very thick, does not appear above half the ſize of the firſt. There are pieces of Juſtinian which weigh a whole ounce; but the ſize of copper was increaſed as the ſilver became ſcarcer; and the value of the coinage cannot be deduced from the weight of the coins, as it is plain that our own coinage is not of half the value with regard to the metal. A great number of medallions were ſtruck by Conſtantius II. but there is no other copper larger than the half ounce, excepting that of Anaſtaſius, when the follis began to be ſtruck larger. All medalliſts allow the others to be medallions.

The metal employed in theſe very ſmall coins, though at firſt of braſs, was always a baſe and refuſe kind; but copper is generally made uſe of in the parts of the as from the earlieſt times to the lateſt; and if braſs be ſometimes employed, it is never ſuch as appears in the ſeſtertii and dupondiarii, which is very fine and beautiful, but only the refuſe. "Yellow braſs of the right ſort (ſays Mr Pinkerton) ſeems totally to have ceaſed in the Roman coinage with the ſeſtertius, under Gallienus, though a few ſmall coins of very bad metal appear under that hue as late as Julian II."

62 Roman ſilver.

Silver was coined in Rome only as late as the 485th year of the city, or 266 B. C. Varro indeed ſpeaks of ſilver having been coined by Servius Tullius, and the libella having been once in ſilver; but Pliny's authority muſt be accounted of more weight than that of this author, as he miſtakes the λιτρα of Sicily for Roman coins, having been current at Rome during the time of the firſt Punic war. Even Pliny, according to our author, very frequently miſtakes with regard to matters much antecedent to his own time; and

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among the moderns he criticiſes ſeverely Eraſmus and Hume. "Eraſmus (ſays he), who had been in England for ſome time, talks of leaden money being uſed here. Not even a leaden token was ſtruck in the reign of Henry VIII.; yet his authority has been followed with due deference to ſo great a name; for how could Eraſmus, who muſt have ſeen the matter with his own eyes, aſſert a direct falſehood? To give a later inſtance in a writer of reputation, Mr Hume, in vol. vi. of his hiſtory, has theſe words, in treating of the reign of James I. "It appears that copper halfpence and farthings began to be coined in this reign. Tradeſmen had commonly carried on their retail buſineſs by leaden tokens. The ſmall ſilver penny was ſoon loſt; and at this time was nowhere to be found." Copper halfpence and farthings were not ſtruck till Charles II. 1672: there were ſmall tokens for farthings ſtruck in copper by James I. but not one for the halfpenny. The ſilver farthings had ceaſed with Edward VI. but the ſilver half-pence continued the ſole coins till Charles II. It was by copper tokens that ſmall buſineſs was carried on. The ſilver penny was much uſed till the end of the reign of George I.; and, ſo far from being nowhere to be found, is ſuperabundant of every reign ſince that period, not excepting even the preſent reign of George III. From theſe inſtances the reader may judge how ſtrangely writers of all ages blunder, when treating a ſubject of which they are entirely ignorant."

63 Denarii when firſt coined,

The firſt ſilver denarii coined at Rome, are ſuppoſed by our author to have been thoſe which are impreſſed with the Roma; and he inclines to account thoſe the moſt ancient which have a double female head on the one ſide, and on the reverſe Jupiter in a car, with Victory holding the reins, and the word Roma indented in a rude and ſingular manner. The double female head ſeems to denote Rome, in imitation of the Janus then upon the as. There are 15 of theſe in the cabinet of Dr Hunter; one of the largeſt weighs 98½ grains: and the reſt, which ſeem to be of greateſt antiquity, are of various weights betwixt that and 84; the ſmaller and more modern weigh 58 or 59 grains; but Mr Pinkerton is of opinion, that the large ones are of the very firſt Roman coinage, and ſtruck during that interval of time betwixt the coinage of the firſt ſilver denarius and the as of two ounces. He takes the indentation of the word Roma to be a mark of great antiquity; ſuch a mode being ſcarcely known any where elſe, except in Caulonia, Crotona, and other towns of Italy; all of them allowed to be ſtruck at leaſt 400 B. C. As theſe large coins are not double denarii, they muſt have been ſtruck prior to the ſmall ones; and Newmann has given an account of one of them recoined by Trajan, in which the indentation of Roma is carefully preſerved. The firſt denarius was in value 10 aſes, when the as weighed three ounces; and allowing 90 grains at a medium for one of theſe large denarii, the proportion of copper to ſilver muſt have been as 1 to 160; but when the as fell to one ounce, the proportion was as 1 to 80: when it fell to half an ounce, ſo that 16 aſes went to the denarius, the proportion was as 1 to 64, at which it remained. Copper with us, in coinage, is to ſilver as 1 to 40; but in actual value as 1 to 72.

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[63] Value of the denarius and its parts,

At Rome the denarius was worth 8d.; the quinarius 4d.; and the ſeſtertius, whether ſilver or braſs, 2d. The denarius is the coin from which our penny is derived, and was the chief ſilver coin in Rome for 600 years. According to Celſus, ſeven denarii went to the Roman ounce, which in metals did not exceed 430 grains; but as all the denarii hitherto met with weigh at a medium only 60 grains, this would ſeem to make the Roman ounce only 420 grains; though perhaps this deficiency may be accounted for from the unavoidable waſte of metal even in the beſt preſerved of theſe coins. According to this proportion the Roman pound contained 84 denarii; but in tale there was a very conſiderable exceſs: for no fewer than 100 denarii went to the Roman pound. The Greek ounce appears to have been conſiderably larger than that of Rome, containing about 528 grains; yet notwithſtanding this apparently great odds, the difference in the coins was ſo ſmall, that the Greek money went current in Rome, and the Roman in Greece. The denarius at firſt went for 10 aſſes, and was marked X; it was afterwards raiſed to 16; which Mr Pinkerton ſuppoſes to have been about 175 B. C. Some are met with bearing the number XVI. nay, with every number up to CCCCLXXVI. Theſe large numbers are ſuppoſed to have been mint-marks of ſome kind or other. After being raiſed to 16 aſes, it continued at the ſame value till the time of Gallienus: ſo that till that time we are to look upon its conſtituent parts to be 16 aſes or aſſaria, eight dupondii, four braſs ſeſtertii, and two ſilver quinarii. Under the emperor Severus, however, or his ſucceſſor Caracalla, denarii were ſtruck of two ſizes, one of them a third heavier than the common; which we muſt of conſequence ſuppoſe to haveborne a third more value. This large piece obtained the name of *argenteus*, and *argenteus Philippus*, or the "ſilver Philip;" the name of Philip having become common to almoſt every coin. The common denarii now began to be termed *minuti* and *argentei Philippi minutuli*, &c. to expreſs their being ſmaller than the reſt. Some have imagined that the large denarii were of the ſame value with the ſmall, only of worſe metal; but Mr Pinkerton obſerves, that among the few which have any difference of metal, the ſmalleſt are always the worſt. The firſt mention of the *minuti* is in the time of Alexander Severus, who reduced the price of pork from eight minuti at Rome to two and to one. The *minutus argenteus* of that age was about 40 grains; and from the badneſs of the metal was not worth above 4d. of our money. Thus the price of meat was by this prince reduced firſt to 8d. and then to 4d.

64 Reſtoration of the purity of the Roman coins,

According to Zozimus and other writers, the purity of the Roman coin was reſtored by Aurelian: but Mr Pinkerton controverts this opinion; thinking it more probable, that he only made the attempt without ſucceſs; or that his reformation might be entirely confined to gold, on which there is an evident change after the time of this emperor. His ſucceſſor Tacitus is ſaid to have allowed no braſs to be mixed with ſilver upon any account; yet the few coins of this emperor are very much alloyed. We are certain, however, that the emperor Diocleſian reſtored the ſilver to its ancient purity; the denarii ſtruck in his reign being very ſmall indeed, but of as fine ſilver as the moſt ancient coins of the empire. After Gordian III. the ſmall denarius entirely vaniſhed, while the large one was ſo much diminiſhed, that it reſembled the *minutus*, or ſmall one of Carcalla in ſize. Gallienus introduced the *denarii ærei* inſtead of the *ſeſtertii.* The *argenteus*, though reduced more than one third in ſize, contained ſix denarii aerei, the old ſtandard of ſeſtertii. According to the writers of this period, and ſome time afterwards, the denarius or argenteus contained 60 aſſaria; whence it follows, that each denarius æreus had 10; and from this it probably had its name. The aſſaria are of the ſize of the argentei already mentioned; and ſhow the copper to have retained nearly its old proportion of value to the ſilver, viz. 1 to 60.

65
Reformation of the ſilver coin by Conſtantine.

A larger ſilver coin was introduced by Conſtantine I. who accommodated the new money to the pound of gold in ſuch a manner, that 1000 of the former in tale were equal to the latter in value; ſo that this new piece from thence obtained the name of the *milliarenſis* or "thouſander." Its weight at a medium is 70 grains, or 70 to the pound of ſilver: but Mr Pinkerton is of opinion, that it might have contained 72 grains, of which two have now periſhed by the ſoftneſs of the ſilver; that the pound contained 72; or that two of the number might be allowed for coinage; while the alloy alone would pay for coining gold. The code ſays, that 60 went to the pound; but the numbers of this are quite corrupt. The *milliarenſis* was worth about a ſhilling ſterling. The argentei or denarii, however, were ſtill the moſt common currency; and having been originally rated at the 100 to the pound of ſilver in tale, they from thence began to be called *centenionales*, or "hundreders." Thoſe of Conſtantine I. and II. Conſtans, and Conſtantius, weigh from 50 grains down to 40; thoſe of Julian and Jovian, from 40 to 30, and of the ſucceeding emperors from the time of Juſtinian, from 30 to 20. Under Heraclius they ceaſed entirely; and from Juſtinian to their total abolition, had been brought down from 15 to 10 grains. A like decreaſe of weight took place in the milliarenſis; thoſe of Conſtantine and Conſtans being above 70 grains in weight; thoſe of Arcadius not above 60; and the milliarenſis of Juſtinian not more than 30 grains; but, from the weight of thoſe in Dr Hunter's cabinet, Mr Pinkerton deduces the medium to have been exactly $70\frac{8}{11}$ grains. Theſe coins were alſo called *majorinæ*.

66
Account of the ſmall Roman coins.

The ſmaller ſilver coins of Rome were, 1. The *quinarius*, at firſt called *victoriatus*, from the image of Victory on its reverſe; and which it continued to bear from firſt to laſt. Its original value was five aſes, but it was afterwards raiſed to eight, when the value of the denarius increaſed to 16. According to Pliny, it was firſt coined in conſequence of the *lex Clodia*, about the 525th year of Rome. Some are of opinion, that it was called κερατιον under the Conſtantinopolitan empire, becauſe it was worth a κερατιον of gold, 144 of which went to the ounce; but this is denied by Mr Pinkerton, becauſe at the time that the word κερατιον firſt appears in hiſtory, the denarius did not weigh above 30 grains; and of conſequence, as 25 muſt have gone to the gold ſolidus, of which there were ſix in the ounce, 130 denarii muſt have gone to the ounce of gold. He is therefore of opinion, that the word κερατιον was only another name for the denarius when much reduced in ſize: probably owing to the great ſcarcity of ſilver in Conſtantinople, though in the ſame city there was plenty of gold; and of conſequence, the gold ſolidus was never diminiſhed. "For Monteſquieu (ſays our author) has well obſerved, that gold muſt be common where ſilver was rare. Hence gold was the common regulation of accounts in the Eaſtern empire." The δικερατιον met with in ancient authors, according to Mr Pinkerton, was merely an improper name for the *milliarenſis*; when, on account of the ſcarcity of ſilver, the denarius was reduced, and no milliarenſis coined: ſo that the current milliarenſis of former reigns happened to be double to the denarius or centenonialis. The quinarius diminiſhes in ſize along with the other coins; thoſe of Auguſtus weighing 30 grains, of Severus 25, of Conſtantine I. 20, of Juſtinian 12, and of Heraclius only 5. A new ſilver coinage ſeems to have taken place after the days of this emperor; as the little we then meet with, which in the beſt cabinets ſcarce exceeds a dozen of coins, conſiſts entirely of large unſhapely pieces of coarſe metal.

67
Diviſion of the denarius.

2. The conſular denarius had alſo four ſilver ſeſtertii, till the as fell to half an ounce, when it was thought proper to coin the ſeſtertius in braſs, as it continued to be ever afterwards. "The very laſt ſilver ſeſtertius (Says Mr Pinkerton) which appears, is one with a head of Mercury, and H. S.; on the reverſe a Caduceus P. SEPVLLIVS; who appears to be the P. SEPVLLIVS MACER of the denarii of Julius Cæſar. If ſo, as is moſt probable, the ſeſtertius was coined in ſilver down to Auguſtus; and it is of courſe not to be expected that any of braſs can appear till Auguſtus, under whom they are actually quite common. I have indeed ſeen no coin which could be a conſular braſs ſeſtertius; and though we have certainly braſs dupondii of Cæſar, yet it is reaſonable to infer, that the braſs ſeſtertius was firſt coined by Auguſtus. Not one ſilver ſeſtertius appears during the whole imperial period, yet we know that the ſeſtertius was the moſt common of all ſilver coins. The conſular ſeſtertii of ſilver, marked H. S. are not uncommon, nor the quinarii; but the latter are very ſcarce of all the emperors, if we except one inſtance, the ASIA RECEPTA of Auguſtus.

68
Roman gold.

"The Roman gold coinage was ſtill later than that of ſilver. Pliny tells us, that "gold was coined 62 years after ſilver; and the ſcruple went for 60 ſeſterces. It was afterwards thought proper to coin 40 pieces out of the pound of gold. And our princes have by degrees diminiſhed their weight to 45 in the pound." This account is confirmed by the pieces which ſtill remain; for we have that very coin weighing a ſcruple, which went for 20 ſeſterces. On one ſide is the head of Mars; and on the other an eagle; and it is marked XX. We have another coin of the ſame kind, but double, marked XXXX; and its triple, marked ↓X or 60; the ↓ being the old numeral character for 50." Mr Pinkerton, the diſcoverer of this, treats other medalliſts with great aſperity. Savot and Hardouin are mentioned by name; the latter (he ſays) is "ignorant of common ſenſe;" and neither he nor Savot could explain it but by reading backward; but the 4 for the Roman V, and thus making it xv. Other readings have been given by various medalliſts, but none have hit upon the true one excepting our author, though the coin itſelf led to it, being juſt three times the weight of that marked xx. We have likewiſe half the largeſt coin, which is marked xxx, and which weighs 26 grains; the ſmalleſt is only 17½; the xxxx weighs 34; and the LX or drachma 53. There is alſo the didrachm of this coinage, of 106 grains.

69
Account of the aurei.

The *aurei* or Roman gold coins, were at firſt 48 in the pound; but they were afterwards diminiſhed in number to 40, owing to an augmentation in the weight of each coin. In the time of Sylla, the aureus weighed no leſs than from 164 to 168 grains, and there were only 30 in the pound; but ſuch confuſion in the coinage was introduced by that conqueror, that no perſon could know exactly what he was worth. Till this time the aureus ſeems to have continued of the value of 30 ſilver denarii, about one pound ſterling; for about that time it was enlarged a whole third, that it might ſtill be equivalent to the full number of denarii. But after Sylla had taken Athens, and the arts and manners of Greece became objects of imitation to the Romans, the aureus fell to 40 in the pound, probably when Sylla had abdicated his dictatorſhip. Thus, being reduced near to the ſcale of the Greek χρυσος, it paſſed for 20 denarii, as the latter did for as many drachmas, being in currency 13s. 4d. ſterling. "This (ſays Mr Pinkerton) is the more probable, becauſe we know from Suetonius, that the great Cæſar brought from Gaul ſo much gold, that it ſold for nine times its weight of ſilver: but the Gallic gold was of a very baſe ſort."

In the time of Claudius, the aureus was valued at 100 ſeſtertii, or 25 ſilver denarii, at which it continued till the time of Heliogabalus, when it fell to about 92 grains at a medium, or roſe in number to 55 in the pound. In the reign of Philip, during which the city completed its thouſandth year, the aureus was coined of two or three ſizes. Theſe are impreſſed with a head of Rome on one ſide, and various figures on the other; but the workmanſhip is ſo rude, that they are ſuppoſed to have been ſtruck in ſome of the more uncivilized provinces of the empire. The practice of having different gold coins, however, continued under Valerian, Gallienus, and his ſucceſſors. In the time of Gallienus, they were of 30, 65, and from 86 to 93 grains; the double aurei being from 172 to 183½ grains; but the aureus properly ſo called was from 86 to 93; thoſe of 30 and 32 being the *trientes aurei* of the *Hiſtoriæ Auguſtæ Scriptores;* while the larger, from 62 to 65, are to be accounted double trientes and were perhaps called *minuti aurei.* The value of theſe different ſizes of aurei is not known.

70
Alteration in the gold coin made by Aurelian.

That Aurelian made ſome alteration in the coin is certain; but Mr Pinkerton ſuppoſed it to have been only in the gold; becauſe under him and his ſucceſſor Probus, the common aureus was of 100 grains, a ſize confined to thoſe emperors: there are likewiſe halves of about 50 grains; and double aurei, commonly of very fine workmanſhip, of upwards of 200 grains. In the time of Gallienus, the precious metal was ſo common, that this emperor vied in magnificence with Nero and Heliogabalus. Aurelian, who plundered the rich city of Palmyra, and thus became maſter of the treaſures of the eaſt, obtained ſuch a profuſion of gold, that he looked upon it to be produced by nature in greater plenty than ſilver. It is remarkable, that during this emperor's reign there was a rebellion among the money-coiners, which could not be quelled but by the diſtruction of ſeveral thouſands; which Mr Pinkerton aſcribes to his having ordered the gold to be reſtored to its former ſize, but to go for no more ſilver than it formerly did. "So very little ſilver (ſays he) occurs of this period, that it is plain no alteration in the ſilver produced the war with the moneyers: and in the braſs he made no change; or if he had, it were ſtrange that ſuch commotions ſhould ariſe about ſo trifling a metal. But if, as appears from the coins, he ordered the aureus, which had fallen to 80 grains, to be raiſed to about 100, it is no wonder that the contractors ſhould be in an uproar; for a whole quarter of their coinage, amounting as would ſeem to all their profits, was loſt. Aurelian judged, that when he found gold ſo common in the eaſt, it was equally ſo in the weſt; and that the moneyers muſt have made a moſt exorbitant profit; but his ideas on this ſubject were partial and unjuſt: and after his ſhort reign, which did not exceed five months after the alteration, the gold returned to its former courſe; though a few pieces occur of Aurelian's ſtandard, ſtruck, as would ſeem, in the commencement of the reign of Probus his ſucceſſor.

From this time to that of Conſtantine I. the aureus weighed between 70 and 80 grains; but in his reign it was changed for the ſolidus, of which ſix went to the ounce of gold, which went for 14 milliarenſes, and 25 denarii as before; the value of ſilver being now to gold as 14 to 1. This new coin continued of the ſame value to the final downfall of the Conſtantinopolitan empire; gold being always very plentiful in that city, though ſilver became more and more ſcarce. The ſolidus was worth 12s. ſterling. Here again our author moſt ſeverely criticiſes Mr Clarke and Mr Raper: the former (he ſays) with reſpect to the value of gold in the time of Conſtantine I. "has left all his ſenſes behind him. In page 267. he abſurdly aſſerts, that 20 denarii went to the ſolidus in the time of Theodoſius I. and proceeds with this deplorable error to the end of his work. He then tells us, that only 14 denarii went to the ſolidus under Conſtantine I. &c." To Mr Raper, however, he is a little more merciful, as he owns, that "though he (Mr Raper) has ſtrangely confounded the milliarenſis with the denarius, he has yet kept common ſenſe for his guide." Mr Pinkerton argues, indeed with great probability, "that had any change in the coinage taken place between the time of Conſtantine and Theodoſius I. that is, in leſs than 50 years, the laws of that period, which are all in the Theodoſian code, muſt have noticed it." To this and other arguments upon the ſubject, Mr Pinkerton adds the following obſervation upon the value of gold and ſilver: "As a ſtate advances to its height, gold increaſes in value; and as a ſtate declines, it decreaſes, providing the metals are kept on a par as to purity. Hence we may argue, that gold decreaſed in its relation to ſilver perhaps four or five centuries, furniſhed moſt European kingdoms with gold in coin, which otherwiſe would, from their want of arts, and of intercourſe with the eaſt, then the grand ſeminary of that metal, have almoſt been ignorant of what gold was. Theſe gold coins were called *Bezants* in Europe, becauſe ſent from Byzantium or Conſtantinople; and were *ſolidi* of the old ſcale, ſix to the ounce. In Byzantine writers, the ſolidus is alſo called *nomiſma*, or "the coin;" *cryſinos*, becauſe of gold; *hyperperos*, from its being refined with fire, or from its being of bright gold flaming like fire. The *ſolidi* alſo, as the *aurei* formerly, received names from the princes whoſe portraits they bore; as *Michelati*, *Manuelati*. *Solidus* is a term uſed alſo for the aureus by Apuleius, who lived in the time of Antoninus the Philoſopher; nay, as early as in the Prætorian edicts of the time of Trajan, It was then a diſtinction from the ſemiſſis or half. In the time of Valerian, when aurei of different ſizes had been introduced, it became neceſſary to diſtinguiſh the particular aurei meant. Hence in the Imperial Reſcripts, publiſhed by the *Hiſtoriæ Auguſtæ Scriptores*, Valerian uſes the term *Philippeos noſtri vultus*, for the common aurei. Aurelian uſes the ſame term *aurei Philippei*, for the aurei which he had reſtored to their ſize in ſome degree. Gallienus uſes *aurei Valeriani* for his father's coins. *Aurei Antoniniani* are likewiſe put by Valerian for coins of the early Antonini, of ſuperior ſtandard to any then uſed.

71 Diviſions of the aureus.

In the firſt gold coinage at Rome, the aureus was divided into four parts; the ſemiſſis of 60 ſeſtertii; the tremiſſis, or third, of 30; the fourth, the name of which is not mentioned, of 40; and the ſcrupulum of 20. But in a ſhort time all of theſe fell into diſuſe, except the ſemiſſis or half, which is extremely ſcarce; ſo that it is probable that few have been ſtruck. It is an erroneous opinion (according to Mr Pinkerton) that the ſemiſſis was called a *denarius aureus*. The aureus itſelf indeed had this name; but the name of *quinarius* is applied to the ſemiſſis with greater propriety than the former. Trientes, or tremiſſes of gold, are found of Valerian and his ſon Gallienus, and weigh about 30 grains. Thoſe of Salonina the wife of Gallienus weigh 33 grains. Under the Conſtantinopolitan empire, tremiſſes again make their appearance; and from the time of Valentinian downwards, the thirds are the moſt common coins of gold, being worth about 4 s. ſterling. The ſemiſſis is likewiſe mentioned, but none occur earlier than the time of Baſiliſcus. The gold tremiſſis was the pattern of the French and Spaniſh gold coins; as the ſilver denarius, in its diminiſhed ſtate, was of the Gothic and Saxon penny.

72 Account of the Roman method of coining.

We ſhall cloſe this account of the Roman money with ſome remarks concerning the mint, and method of coinage. This at firſt ſeems to have been under the direction of the quæſtor. About the time that ſilver was firſt coined in Rome, *viz.* about 266 B. C. the *triumviri monetales* were created. They were at firſt of ſenatorial rank, but were by Auguſtus choſen from among the equeſtrian; and the title of *triumviri* was continued till after the time of Caracalla; but under Aurelian there was probably but one maſter of the mint called *Rationalis*; and Mr Pinkerton is of opinion that the change took place under Gallienus. He ſeems alſo to have permitted the provincial cities to coin gold and ſilver, as well as to have altered the form of the mints in the capital, and to have ordered them all to ſtrike money with Latin legends, and of the ſame forms; as in his time we firſt meet with coins with mint-marks of cities and offices. The violent inſurrection which took place in his reign has already been mentioned, as well as its probable cauſe; and Mr Gibbon has ſhown, that the concealed enemies of Aurelian took ſuch advantage of this inſurrection, that it coſt 7000 of his beſt troops before it could be quelled. About this time the *procurator monetæ* ſeems to have ſucceeded the *rationalis* as director of the mint. In the colonies, the direction of the mint ſeems to have been given to the decemviri, whoſe names frequently occur on colonial coins; "which (ſays Mr Pinkerton), though generally of rude invention, and ruder execution, are yet often intereſting and important."

The engraving of the ancient dyes uſed in coinage was a work of much genius and labour; and at Rome Greek artiſts were generally employed in it; but it has been thought a matter of great ſurpriſe, that ſcarce any two ancient coins are to be found exactly the ſame. Hence ſome antiquaries have imagined, that only a ſingle coin was thrown off from each dye. M. Beauvais informs us, that the only two Roman imperial coins of the firſt times which he had ſeen perfectly alike were thoſe of the emperor Galba. It is, however, the opinion of the beſt judges, that a perfect ſimilarity betwixt two medals is a very great reaſon for ſuppoſing one of them to be forged. "It muſt alſo be obſerved (ſays Mr Pinkerton), that the differences in coins, apparently from the ſame dye, are often ſo minute as to eſcape an eye not uſed to microſcopic obſervations of this ſort. But it would be ſurpriſing if any two ancient coins were now found ſtruck with the ſame dye; for out of each million iſſued, not above one has reached us. Dyes ſoon give way by the violence of the work; and the ancients had no puncheons nor matrices, but were forced to engrave many dyes for the ſame coin. Even in our mint, upon ſending for a ſhilling's worth of new halfpence, it will appear that three or four dyes have been uſed. Sometimes the obverſe of the dye gives way, ſometimes the reverſe; but among us it is renewed by puncheons, though with variations in the lettering or other minute ſtrokes; while the ancients were forced to recur to another dye differently engraven. The engravers of the dye were called *cælatores*; other officers employed in the mint were the *ſpectatores*, *expectatores*, or *nummularii*. The melters were ſtyled *fuſarii*, *flatuarii*, and *flaturarii*; thoſe who adjuſted the weight were called *æquatores monetarum*; thoſe who put the pieces into the dye *ſuppoſitores*, and thoſe who ſtruck them *malleatores*. At the head of each office was an officer named *primicerius*, and the foreman was named *optio et exactor*."

In order to aſſiſt the high relief on the coins, the metal, after being melted and refined, was caſt into bullets, as appears from the ancient coins not being cut or filed on the edges, but often cracked, and always rough and unequal. Theſe bullets were then put into the dye, and received the impreſſion by repeated ſtrokes of the hammer, though ſometimes a machine appears to have been uſed for this purpoſe: for Boiterue informs us, that there was a picture of the Roman mintage in a grotto near Baiæ, where a machine was repreſented holding up a large ſtone as if to let it fall ſuddenly, and ſtrike the coin at once. None of the ancient money was caſt in moulds, excepting the moſt ancient and very large Roman braſs, commonly called *weights*, and other Italian pieces of that ſort; all the reſt being mere forgeries of ancient and modern times. Some Roman moulds which have been found are a proof of this; and from theſe ſome medalliſts have erroneouſly imagined that the ancients firſt caſt their money in mould, and then ſtamped it, in order to make the impreſſion more clear and ſharp.

The ancients had ſome knowledge of the method of crenating the edges of their coins, which they did by cutting out regular notches upon them; and of this kind we find ſome of the Syrian and ancient conſular coins, with a few others. The former were caſt in this ſhape, and then ſtruck; but the latter were crenated by inciſion, to prevent forgery, by ſhowing the inſide of the metal: however, the ancient forgers alſo found out a method of imitating this; for Mr Pinkerton informs us, that he had a Roman conſular coin, of which the inciſions, like the reſt. were plated with ſilver over the copper.

SECT. VI. *Of the Preſervation of Medals.*

WE now come to conſider what it is that diſtinguiſhes one medal from another, and why ſome are ſo highly prized more than others. This, in general, beſides its genuineneſs, conſiſts in the high degree of preſervation in which it is. This, by Mr Pinkerton, is called *conſervation* of medals, and is by him regarded as *good* and as *perfect*. In this, he ſays that a true judge is ſo nice, that he will reject even the rareſt coins if in the leaſt defaced either in the figures or legend. Some, however, are obliged to content themſelves with thoſe which are a little rubbed, while thoſe of ſuperior taſte and abilities have in their cabinets only ſuch as are in the very ſtate in which they came from the mint; and ſuch, he ſays, are the cabinets of Sir Robert Auſtin, and Mr Walpole of Roman ſilver at Strawberryhill. It is abſolutely neceſſary, however, that a coin be in what is called *good* preſervation; which in the Greek or Roman emperors, and the colonial coins, is ſuppoſed to be when the legends can be read with ſome difficulty; but when the conſervation is perfect, and the coin juſt as it came from the mint, even the moſt common coins are valuable.

73 Braſs and copper beſt preſerved by the ruſt that covers them.

The fine ruſt, like varniſh, which covers the ſurface of braſs and copper coins, is found to be the beſt preſerver of them; and is brought on by lying in a certain kind of ſoil. Gold cannot be contaminated but by iron mold, which happens when the coin lies in a ſoil impregnated with iron; but ſilver is ſuſceptible of various kinds of ruſt, principally green and red; both of which yield to vinegar. In gold and ſilver coins the ruſt muſt be removed, as being prejudicial; but in braſs and copper it is preſervative and ornamental; a circumſtance taken notice of by the ancients.

74 Different kinds of this ruſt.

"This fine ruſt (ſays Mr Pinkerton), which is indeed a natural varniſh not imitable by the art of man, is ſometimes a delicate blue, like that of a turquoiſe; ſometimes of a bronze brown, equal to that obſervable in ancient ſtatues of bronze, and ſo highly prized; and ſometimes of an exquiſite green, a little on the azure hue, which laſt is the moſt beautiful of all. It is alſo found of a fine purple, of olive, and of a cream colour or pale yellow: which laſt is exquiſite, and ſhows the impreſſion to as much advantage as paper of cream colour, uſed in all great foreign preſſes, does copperplates and printing. The Neapolitan patina (the ruſt in queſtion) is of a light green; and when free from excreſcence or blemiſh is very beautiful. Sometimes the purple patina gleams thro' an upper coat of another colour, with as fine effect as a variegated ſilk or gem. In a few inſtances a ruſt of a deeper green is found: and it is ſometimes ſpotted with the red or bronze ſhade, which gives it quite the appearance of the Eaſt Indian ſtone called the *blood-ſtone*. Theſe ruſts are all, when the real product of time, as hard as the metal itſelf, and preſerve it much better than any artificial varniſh could have done; concealing at the ſame time not the moſt minute particle of the impreſſion of the coin."

75 Medals how diminiſhed in value.

The value of medals is lowered when any of the letters of the legend are miſplaced; as a ſuſpicion of forgery is thus induced. Such is the the caſe with many of thoſe of Claudius Gothicus. The ſame, or even greater, diminution in value takes place in ſuch coins as have not been well fixed in the dye, which has occaſioned their ſlipping under the ſtrokes of the hammer, and thus made a double or triple image. Many coins of this kind are found in which the one ſide is perfectly well-formed, but the other blundered in the manner juſt mentioned. Another blemiſh, but of ſmaller moment, and which to ſome may be rather a recommendation, is when the workmen through inattention have put another coin into the dye without taking out the former. Thus the coin is convex on one ſide, and concave on the other, having the ſame figure upon both its ſides.

75 Countermarked medals.

The medals ſaid by the judges in this ſcience to be *countermarked* are very rare, and highly valued. They have a ſmall ſtamp impreſſed upon them, in ſome an head, in others a few letters, ſuch as AUG: N. PROBUS, &c. which marks are ſuppoſed to imply an alteration in the value of the coin; as was the caſe with the countermarked coins of Henry VIII. and Queen Mary of Scotland. Some have a ſmall hole through them; ſometimes with a little ring faſtened in it, having been uſed as ornaments; but this makes no alteration in their value. Neither is it any diminution in the value of a coin that it is ſplit at the edges; for coins of undoubted antiquity have often been found in this ſtate, the cauſe of which has already been explained. On the contrary, this cracking is generally conſidered as a great merit; but Mr Pinkerton ſuſpects that one of theſe cracked coins has given riſe to an error with reſpect to the wife of Carauſius who reigned for ſome time in Britain. The inſcription is read ORIUNA AUG: and there is a crack in the medal juſt before the O of oriuna. Without this crack Mr Pinkerton ſuppoſes that it would have been read FORTUNA AUG.

76 Silver and gold how tarniſhed.

Some particular ſoils have the property of giving ſilver a yellow colour as if it had been gilt. It naturally acquires a black colour through time, which any ſulphureous vapour will bring on in a few minutes. From its being ſo ſuſceptible of injuries, it was always mixed by the ancients with much alloy, in order to harden it. Hence the impreſſions of the ancient ſilver coins remain perfect to this day, while thoſe of modern coins are obliterated in a few years. On this ac-

Preſervation.

account Mr Pinkerton expreſſes a wiſh, that modern ſtates would allow a much greater proportion of alloy in their ſilver coin than they uſually do. As gold admits of no ruſt except that from iron abovementioned, the coins of this metal are generally in perfect conſervation, and freſh as from the mint.

77 How to cleanſe them.

To cleanſe gold coins from this ruſt, it is beſt to ſteep them in aquafortis, which, though a very powerful ſolvent of other metals, has no effect upon gold, Silver may be cleanſed, by ſteeping for a day or two in vinegar, but more effectually by boiling in water with three parts of tartar and one of ſea-ſalt; on both theſe metals, however, the ruſt is always in ſpots, and never forms an entire incruſtation as on braſs or copper. The coins of theſe two metals muſt never be cleanſed, as they would thus be rendered full of ſmall holes eaten by the ruſt. Sometimes, however, they are found ſo totally obſcured with ruſt, that nothing can be diſcovered upon them; in which caſe it is beſt to clear them with a graver; but it may alſo be done by boiling them for 24 hours in water with three parts of tartar and one of alum; not ſea-ſalt as in ſilver coins.

78 Why ancient coins are in ſuch an high ſtate of preſervation.

The high ſtate of preſervation in which ancient coins are uſually found, is thus accounted for by Mr Hancarville. He obſerves, that the chief reaſon is the cuſtom of the ancients always to bury one or more coins with their dead, in order to pay for their paſſage over the river Styx. "From Phidon of Argos (ſays he) to Conſtantine I. are 36 generations: and from Magna Græcia to the Euphrates, from Cyrene to the Euxine Sea, Græcian arts prevailed, and the inhabitants amounted to about 30,000,000. There died therefore, in that time and region, not leſs than ten thouſand millions of people, all of whom had coins of one ſort or other buried with them. The tombs were ſacred and untouched; and afterwards neglected, till modern curioſity or chance began to diſcloſe them. The urn of Flavia Valentina, in Mr Towley's capital collection, contained ſeven braſs coins of Antoninus Pius and Eleagabalus. Such are generally black, from being burnt with the dead. The beſt and freſheſt coins were uſed on theſe occaſions from reſpect to the dead; and hence their fine conſervation. At Syracuſe a ſkeleton was found in a tomb, with a beautiful gold coin in its mouth; and innumerable other inſtances might be given, for hardly is a funeral urn found without coins. Other incidents alſo conſpire to furniſh us with numbers of ancient coins, though the above-recited circumſtance be the chief cauſe of perfect conſervation. In Sicily, the ſilver coins with the head of Proſerpine were found in ſuch numbers as to weigh 600 French livres or pounds. In the 16th century, 60,000 Roman coins were found at Modena, thought to be a military cheſt hid after the battle of Bedriacum, when Otho was defeated by Vitellius. Near Breſt, in the year 1760, between 20 and 30,000 Roman coins were found. A treaſure of gold coins of Lyſimachus was found at Deva on the Marus; and Strabo, lib. vii. and Pauſan *in Attic.* tell that he was defeated by the Getæ; at which time this treaſure ſeems to have fallen into their hands.

79 Number of ancient coins.

Thus Mr Pinkerton, from the authority of Mr Hancarville and others: but conſidering theſe vaſt numbers of coins found in various places, it ſeems ſurpriſing how ſo few ſhould now remain in the cabinets of the curious, as the ſame author informs us that the whole of the different ancient coins known to us amount only to about 80,000, though he owns that the calculation cannot be eſteemed accurate.

Sect. VII. *How to diſtinguiſh true Medals from counterfeits.*

How to diſtinguiſh true from counterfeits.

The moſt difficult and the moſt important thing in the whole ſcience of medals is the method of diſtinguiſhing the true from the counterfeit. The value put upon ancient coins made the forgery of them almoſt coeval with the ſcience itſelf; and as no laws inflict a puniſhment upon ſuch forgers, men of great genius and abilities have undertaken the trade; but whether to the real detriment of the ſcience or not, is a matter of ſome doubt; for if only exact copies of genuine medals are ſold for the originals, the impoſition may be deemed trifling; but the caſe muſt be accounted very different, if people take it upon them to forge medals which never exiſted. At firſt the forgeries were extremely groſs; and medals were forged of Priam, of Ariſtotle, Artemiſia, Hannibal, and moſt of the other illuſtrious perſonages of antiquity. Moſt of theſe were done in ſuch a manner, that the fraud could eaſily be diſcovered; but others have impoſed even upon very learned men. Mr Pinkerton mentions a remarkable medal of the emperor Heraclius, repreſenting him in a chariot on the reverſe, with Greek and Latin inſcriptions, which Joſeph Scaliger and Lipſius imagine to have been ſtruck in his own time, but which was certainly iſſued in Italy in the 15th century. "Other learned men (ſays our author) have been ſtrangely miſled when ſpeaking of coins; for to be learned in one ſubject excludes not groſs ignorance in others. Budæus, de Aſſe, quotes a denarius of Cicero, M. TULL. Eraſmus, in one of his Epiſtles, tells us with great gravity, that the gold coin of Brutus' ſtruck in Thrace, ΚΟΣΩΝ, bears the patriarch Noah coming out of the ark with his two ſons, and takes the Roman eagle for the dove with the olive branch. Winkelman, in his letters, informs us, that the ſmall braſs piece with Virgil's head, reverſe EPO, is undoubtedly ancient Roman; and adds, that no knowledge of coins can be had out of Rome: but Winkelman, ſo converſant in ſtatues, knew nothing of coins. It is from other artiſts and other productions that any danger of deceit ariſes. And there is no wonder that even the ſkilful are miſled by ſuch artiſts as have uſed this trade; for among them appear the names of Victor Gambello, Giovani del Cavino, called the PADUAN, and his ſon Aleſſandro Baſſiano likewiſe of Padua, Benvenuto Cellini, Aleſſandro Greco, Leo Aretino Jacobo da Frezzo, Federigo Bonzagna and Giovani Jacopo, his brother; Sebaſtiano Plumbo, Valerio de Vicenza, Gorlæus a German, Carteron of Holland, and others, all or moſt of them of the 16th century; and Cavino the Paduan who is the moſt famous, lived in the middle of that century. The forgeries of Cavino are held in no little eſteem, being of wonderful execution. His and thoſe of Carteron are the moſt numerous many of the other artiſts here mentioned not having forged above two or three coins. Later forgers

80 Coins forged by excellent artiſts.

were

How to diſtinguiſh true from counterfeits.

were Dervieu of Florence who confined himſelf to medallions, and Cogornier who gave coins of the 30 tyrants in ſmall braſs. The chief part of the forgeries of Greek medals which have come to my knowledge are of the firſt mentioned, and a very groſs kind, repreſenting perſons who could never appear upon coin, ſuch as Priam, Æneas, Plato, Alcibiades, Artemiſiat, and others. The real Greek coins were very little known or valued till the works of Goltzius appeared, which were happily poſterior to the æra of the grand forgers. Why later forgers have ſeldom thought of counterfeiting them cannot eaſily be accounted for, if it is not owing to the maſterly workmanſhip of the originals, which ſets all imitation at defiance. Forgeries however, of moſt ancient coins may be met with, and of the Greek among the reſt.

81
Roman forgeries more conſpicuous than Greek ones.

"The forgeries are more conſpicuous among the Roman medals than any other kind of coins; but we are not to look upon all theſe as the work of modern artiſts. On the contrary, we are aſſured that many of them were fabricated in the times of the Romans themſelves, ſome of them being even held in more eſtimation than the genuine coins themſelves on account of their being plated, and otherwiſe executed in a manner to which modern forgers could never attain. Even the ancients held ſome of theſe counterfeits in ſuch eſtimation, that Pliny informs us there were frequently many true denarii given for one falſe one."—Caracalla is ſaid to have coined money of copper and lead plated with ſilver; and plated coins, the work of ancient forgers occur of many Greek cities and princes; nay, there are even forgeries of barbaric coins. "Some Roman coins (ſays Mr Pinkerton) are found of iron or lead plated with braſs, perhaps trials of the ſkill of the forger. Iron is the moſt common; but one decurſio of Nero is known of lead plated with copper. Neumann juſtly obſerves, that no hiſtoric faith can be put in plated coins, and that moſt faulty reverſes, &c. ariſe from plated coins not being noticed as ſuch. Even of the Roman conſular coins not very many have ever been forged. The celebrated ſilver denarius of Brutus, with the cap of liberty and two daggers, is the chief inſtance of a conſular coin of which a counterfeit is known. But it is eaſily rejected by this mark; in the true coin the cap of liberty is below the guard or hilt of the daggers; in the falſe, the top of it riſes above that hilt."

82
Denarius of Brutus.

83
Imperial medals.

The imperial ſeries of medals is the grand object of modern medallic forgeries; and the deception was at firſt extended to the moſt eminent writers upon the ſubject. The counterfeits are by Mr Pinkerton divided into ſix claſſes:

I. Such as are known to be imitations, but valued on account of the artiſts by which they are executed. In this claſs the medals of the Paduan rank higheſt; the others being ſo numerous, that a complete ſeries of imperial medals of almoſt every kind, nay almoſt of every medallion, may be formed from among them. In France, particularly, by far the greater part of the cabinets are filled with counterfeits of the kind. They are diſtinguiſhed from ſuch as are genuine by the following marks: 1. The counterfeits are almoſt univerſally thinner. 2. They are never worn nor damaged. 3. The letters are modern. 4. They are either deſtitute of varniſh entirely, or have a falſe one, which is eaſily known by its being black, ſhining, and greaſy, and very eaſily hurt with the touch of a needle, while the varniſh of ancient medals is as hard as the metal itſelf. Inſtead of the greaſy black varniſh above mentioned, indeed, they have ſometimes a light green one, ſpotted with a kind of iron marks, and is compoſed of ſulphur, verdigris, and vinegar. It may frequently be diſtinguiſhed by the hairſtrokes of the pencil with which it was laid on being viſible upon it. 5. The ſides are either filed or too much ſmoothed by art, or bear the marks of a ſmall hammer. 6. The counterfeits are always exactly circular, which is not the caſe with ancient medals, eſpecially after the time of Trajan.

How to diſtinguiſh true from counterfeits.

84
Paduan forgeries how known.

The Paduan forgeries may be diſtinguiſhed from thoſe of inferior artiſts by the following marks: 1. The former are ſeldom thinner than the ancient. 2. They very ſeldom appear as worn or damaged, but the others very frequently, eſpecially in the reverſe, and legend of the reverſe, which ſometimes, as in forged Othos, appear as half conſumed by time. 3. The letters in moulds taken from the antique coins have the rudeneſs of antiquity. 4. Falſe varniſh is commonly light green or black, and ſhines too much or too little. 5. The ſides of forged coins are frequently quite ſmooth, and undiſtinguiſhable from the ancient, though to accompliſh this requires but little art. 6. Counterfeit medals are frequently as irregular in their form as the genuine; but the Paduan are generally circular, though falſe coins have often little pieces cut off, in perfect imitation of the genuine. 7. In caſt coins the letters do not go ſharp down into the metal, and have no fixed outline; their minute angles, as well as thoſe of the drapery, are commonly filled up, and have not the ſharpneſs of the genuine kind. Where the letters or figures are faint, the coin is greatly to be ſuſpected.

85
Letters the principal criterion of medals.

The letters form the great criterion of medals, the ancient being very rude, but the modern otherwiſe; the reaſon of which, according to Cellini, is, that the ancients engraved all their matrices with the graver on burin, while the modern forgers ſtrike theirs with a punch.

86
Vico's account of falſe patina

According to Vico, the falſe patina is green, black, ruſſet, brown, grey, and iron-colour. The green is made from verdigris, the black is the ſmoke of ſulphur, the grey is made of chalk ſteeped in urine, the coin being left for ſome days in the mixture. The ruſſet is next to the natural, by reaſon of its being a kind of froth which the fire forces from ancient coins; but when falſe it ſhines too much. To make it they frequently took the large braſs coins of the Ptolemies, which were often corroded, and made them red hot in the fire; put the coins upon them, and a fine patina adhered. Our author does not ſay in what manner the iron-covered patina was made. "Sometimes (adds he) they take an old defaced coin, covered with real patina, and ſtamp it anew; but the patina is then too bright in the cavities, and too dull in the protuberances. The trial of braſs coins with the tongue is not to be deſpiſed; for if modern the patina taſtes bitter or pungent, while if ancient it is quite taſteleſs."

Mr Pinkerton informs us, that all medallions from Julius Cæſar to Adrian are much to be ſuſpected of forgery; the true medals of the firſt 14 emperors being

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ing exceedingly valuable, and to be found only in the cabinets of princes.

87
Medals caſt from the Paduan forgeries:

II. The ſecond claſs of counterfeit medals contains thoſe caſt from moulds taken from the Paduan forgeries, and others done by eminent maſters. Theſe are ſometimes more difficult to be diſcovered than the former, becauſe in caſting them they can give any degree of thickneſs they pleaſe; and, filling the ſmall ſand-holes with maſtic, they retouch the letters with a graver, and cover the whole with varniſh. The inſtructions already given for the former claſs, however, are alſo uſeful for thoſe of the ſecond, with this addition, that medals of this claſs are generally lighter than the genuine, becauſe fire rarefies the metal in ſome degree, while that which is ſtruck is rather condenſed by the ſtrokes. In gold and ſilver medals there cannot be any deception of this kind; becauſe theſe metals admit not of patina, and conſequently the varniſh betrays the impoſition. The marks of the file on the margin of thoſe of the ſecond claſs are a certain ſign of forgery; though theſe do not always indicate the forgery to be of modern date, becauſe the Romans often filed the edges of coins to accommodate them to the purpoſes of ornament, as quarter guineas are ſometimes put into the bottom of punch laddles. It is common to imitate the holes of medals made by time by means of aqua-fortis; but this deſtroys the ſides of a coin more effectually than if it had been eat into naturally. The fraud, however, is not eaſily diſtinguiſhed.

88
Medals caſt from an antique.

III. *Medals caſt in moulds from an antique.*—In this mode ſome forgers, as Beauvais informs us, have been ſo very careful, that they would melt a common medal of the emperor whom they meant to counterfeit, leſt the quality of the metal ſhould betray them. "This (ſays Mr Pinkerton) has been done in the ſilver Septimius Severus, with the reverſe of a triumphal arch, for which a common coin of the ſame prince has been melted; and in other inſtances. Putting metals in the fire or upon hot iron to cleanſe them, gives them an appearance of being caſt; for ſome ſpot of the metal being ſofter than the other will run, which makes this one of the worſt methods of cleaning medals.— The directions given for diſcovering the two former deceptions hold good alſo in this.

89
Ancient medals retouched:

IV. *Ancient medals retouched and altered.*—This is a claſs of counterfeits more difficult to be diſcovered than any other. "The art (ſays Mr Pinkerton) exexerted in this claſs is aſtoniſhing; and a connoiſſeur is the leſs apt to ſuſpect it, becauſe the coins themſelves are in fact ancient. The accute minds of the Italian artiſts exerted themſelves in this way, when the other forgeries became common and known. With graving tools they alter the portraits, the reverſes, and the inſcriptions themſelves, in a ſurpriſing manner. Of a Claudius ſtruck at Antioch they make an Otho; of a Fauſtina, a Titiana; of a Julia Severa, a Didia Clara; of a Macrinus, a Peſcennius, &c. Give them a Marcus Aurelius, he ſtarts up a Pertinax, by thickening the beard a little, and enlarging the noſe. In ſhort, wherever there is the leaſt reſemblance in perſons, reverſes, or legends, an artiſt may from a trivial medal generate a moſt ſcarce and valuable one. This fraud is diſtinguiſhable by the falſe varniſh which ſometimes maſks it; but, above all, by the letters of the legend, which are always altered. Though this be ſometimes done with an artifice almoſt miraculous, yet moſt commonly the characters ſtraggle, are diſunited, and not in a line."

How to diſtinguiſh true from counterfeits.

In counterfeits of this kind ſometimes the obverſe is not touched, but the reverſe made hollow, and filled with maſtic coloured like the coin, and engraven with ſuch device and legend as was moſt likely to bring a great price; others are only retouched in ſome minute parts, by which, however, the value of the coin is much diminiſhed. "Againſt all theſe arts (ſays Mr Pinkerton), ſevere ſcrutiny muſt be made by the purchaſer upon the medal itſelf; and the inveſtigation and opinion of eminent antiquaries had upon its being altered, or genuine as it is iſſued from the mint.

90
Medals with new devices, or ſoldered.

V. *Medals impreſſed with new devices, or ſoldered.*— In the firſt article of this claſs the reverſes have been totally filed off, and new ones impreſſed with a dye and hammer. This is done by putting the face or obverſe, which ever is not touched, upon different folds of paſteboard, afterwards applying the dye and ſtriking it with a hammer. The forgery in this claſs is very eaſily diſcovered, as the devices and inſcriptions on the counterfeits are known not to exiſt on true medals: as the Pons Ælius on the reverſe of Adrian; the Expeditio Judaica of the ſame emperor, &c. The difference of fabrication in the face or reverſe will be diſcovered at the firſt glance by any perſon of ſkill.

The ſoldered medals conſiſt of two halves belonging to different medals, ſawed through the middle and then joined with ſolder. This mode of counterfeiting is common in ſilver and braſs coins. "They will take an Antoninus, for example, and ſaw off the reverſe, then ſolder to the obverſe which they have treated in the ſame manner. This makes a medal, which from an unknowing purchaſer, will bring an hundred times the price of the two coins which compoſe it. When the deceit is uſed in braſs coins, they take care that the metals be of one hue; though indeed ſome pretenders in this way ſometimes ſolder copper and braſs together, which at once reveals the deceit. Medals which have a portrait on each ſide, and which are generally valuable, are the moſt liable to a ſuſpicion of this fraud. To a very nice eye the minute ring of ſolder is always viſible; and upon inſerting a graver, the fabrication falls into halves."

In the ſame manner reverſes are ſometimes ſoldered to faces not originally belonging to them, as one mentioned by Petre Jobert of Domitian with an amphitheatre, a reverſe of Titus joined to it. Another art is ſometimes made uſe of in this kind of counterfeits, of which there is an inſtance of the temple of Janus upon Nero's medals; where the middle braſs is taken off, and inſerted in a cavity made in the middle of a large coin of that prince. In the coins of the lower empire, however, the reverſes of medals are ſometimes ſo connected with their obverſes, that a ſuſpicion of forgery ſometimes occurs without any foundation. They are met with moſt commonly after the time of Gallienus, when ſuch a number of uſurpers aroſe, that it was difficult to obtain an exact portrait of their features; the coiners had not time, therefore, to ſtrike a medal for theſe as they could have done for other emperors who reigned longer. Hence, on the reverſe

How to diſtinguiſh true from counterfeits.

of a medal of Marius, who reigned only three days, there is PACATOR ORBIS, which ſhows that at that time they had reverſes ready fabricated, to be applied as occaſion might require.

91 Plated medals, &c.

VI. *Plated medals, or thoſe which have clefts.*—It has been already remarked, that many true medals are cracked in the edges; owing to the repeated ſtrokes of the hammer, and the little degree of ductility which the metal poſſeſſes. This the forgers attempt to imitate by a file; but it is eaſy to diſtinguiſh betwixt the natural and artificial cleft by means of a ſmall needle. The natural cleft is wide at the extremity, and appears to have a kind of almoſt imperceptible filaments; the edges of the crack correſponding with each other in a manner which no art can imitate.

The plated medals which have been forged in ancient time were long ſuppoſed to be capable of reſiſting every effort of modern imitation; but of late years, "ſome ingenious rogues (ſays Mr Pinkerton) thought of piercing falſe medals of ſilver with a red hot needle, which gave a blackneſs to the inſide of the coin, and made it appear plated to an injudicious eye. This fraud is eaſily diſtinguiſhed by ſcraping the inſide of the metal." It is, however, very difficult to diſtinguiſh the forgeries of rude money when not caſt; and our author gives no other direction than to conſult a ſkilful medalliſt. Indeed, notwithſtanding all the directions already given, this ſeems to be a reſource which cannot by any means with ſafety be neglected. A real and practical knowledge of medals "is only to be acquired (ſays he) by ſeeing a great number, and comparing the forged with the genuine. It cannot therefore be too much recommended to the young connoiſſeur, who wiſhes to acquire ſome knowledge in this way, to viſit all the ſales and cabinets he can, and to look upon all ancient medals with a very microſcopic eye. By theſe means only is to be acquired that ready knowledge which enables at firſt glance to pronounce upon a forgery, however, ingenious. Nor let the ſcience of medals be from this concluded to be uncertain; for no knowledge is more certain and immediate, when it is properly ſtudied by examination of the real objects. A man who buys coins, truſting merely to his theoretic peruſal of medallic books, will find himſelf woefully miſtaken. He ought to ſtudy coins firſt, where only they can be ſtudied, in themſelves. Nor can it be matter of wonder or impilcation of caprice, that a medalliſt of ſkill ſhould at one preception pronounce upon the veracity or falſehood of a medal; for the powers of the human eye, employed in certain lines of ſcience, are amazing. Hence a ſtudent can diſtinguiſh a book among a thouſand ſimilar, and quite alike to every other eye: hence a ſhepherd can diſcern, &c.: hence the medalliſt can ſay in an inſtant, 'this is a true coin, and this is a falſe,' though to other people no diſtinction be perceptible."

92 Mr Pinkerton's directions for knowing medals:

93 Forgeries of modern coins

Forgeries of modern coins and medals, Mr Pinkerton obſerves, are almoſt as numerous as of the ancient. The ſatyric coin of Louis XII. PERDAM BABYLONIS NOMEN, is a remarkable inſtance; the falſe coin is larger than the true, and bears date 1512. The rude coins of the middle ages are very early forged, and forgeries have accordingly become common. Forged coins of Alfred and other early princes of England have appeared, ſome of which have been done with great art. "The two noted Engliſh pennies of Rich. I. ſays our author, are of this ſtamp; and yet have impoſed upon Meſſrs Folkes and Snelling, who have publiſhed them as genuine in the two beſt books upon Engliſh coins. But they were fabricated by the late Mr White of Newgate-ſtreet, a noted collector, who contaminated an otherwiſe fair character by ſuch practices. Such forgeries, though eaſy, require a ſkill in the hiſtory and coinage of the time which luckily can hardly fall to the lot of a common Jew or mechanic forger. But the practice is deteſtable, were no gain propoſed: and they who ſtoop to it muſt ſuppoſe, that to embarraſs the path of any ſcience with forgery and futility, implies no infamy. In forgeries of ancient coin, the fiction is perhaps ſufficiently atoned for by the vaſt ſkill required; and the artiſt may plauſibly alledge, that his attention was not to deceive, but to excite his utmoſt powers, by an attempt to rival the ancient maſters. But no poſſible apology can be made for forging the rude money of more modern times. The crime is certainly greater than that which leads the common coiner to the gallows; inaſmuch as it is committed with more eaſe, and the profit is incomparably larger."

Value.

SECT. VIII. *Of the Value of Medals.*

ALL ancient coins and medals, though equally genuine, are not equally valuable. In medals, as well as in every thing elſe, the ſcarcity of a coin ſtamps a value upon it which cannot be otherwiſe derived from its intrinſic worth. There are four or five degrees of rarity reckoned up; the higheſt of which is called *unique*. The cauſe is generally aſcribed to the fewneſs of number thrown off originally, or to their having been called in, and recoined in another form. To the former cauſe Mr Pinkerton aſcribes the ſcarcity of the copper of Otho and the gold of Peſcennius Niger; to the latter that of the coinage of Caligula: "though this laſt (ſays he) is not of ſingular rarity; which ſhows that even the power of the Roman ſenate could not annihilate an eſtabliſhed money; and that the firſt cauſe of rarity, ariſing from the ſmall quantity originally ſtruck, ought to be regarded as the principal."

94 Cauſes of the ſcarcity of medals in ancient cities,

In the ancient cities Mr Pinkerton aſcribes the ſcarcity of coin to the poverty or ſmallneſs of the ſtate; but the ſcarcity of ancient regal and imperial coins ariſes principally from the ſhortneſs of the reign; and ſometimes from the ſuperabundance of money before, which rendered it almoſt unneceſſary to coin any money during the reign of the prince. An example of this we have in the ſcarcity of the ſhillings of George III. which ſhows that ſhortneſs of the reign does not always occaſion a ſcarcity of coin; and thus the coins of Harold II. who did not reign a year, are very numerous, while thoſe of Richard I. who reigned ten, are almoſt unique.

Sometimes the rareſt coins loſe their value, and become common. This our author aſcribes to the high price given for them, which tempts the poſſeſſors to bring them to market; but chiefly to the diſcovering of hoards of them. The former cauſe took place with Queen Anne's farthings, ſome of which formerly ſold at five guineas; nay, if we could believe the newſpapers,

[94] Rare coins ſometimes become common, and *vice verſa.*

pers, one of them was ſome years ago ſold for 960 l. the latter with the coins of Caunte, the Daniſh king of England: which were very rare till a hoard of them was diſcovered in the Orkneys. As diſcoveries of this kind, however, produce a temporary plenty, ſo when they are diſperſed the former ſcarcity returns; while on the other hand ſome of the common coins become rare through the mere circumſtance of neglect.

95 Silver coins in what caſes moſt eſteemed.

As double the number of copper-coins of Greek cities are to be met with that there are of ſilver, the latter are of conſequence much more eſteemed; but the reverſe is the caſe with thoſe of the Greek princes. All the Greek civic coins of ſilver are very rare excepting thoſe of Athens, Corinth, Meſſana, Dyrrhachium, Maſſilia, Syracuſe, and ſome others. Of the Greek monarchic coins the moſt rare are the tetradrachms of the kings of Syria, the Ptolemies, the ſovereigns of Macedon and Bithynia, excepting thoſe of Alexander the Great and Lyſimachus. Thoſe of the kings of Cappadocia are of a ſmall ſize, and ſcarce to be met with. Of thoſe of Numidia and Mauritania, the coins of Juba the father are common: but thoſe of the ſon and nephew Ptolemy ſcarce. Coins of the kings of Sicily, Parthia, and Judæa, are rare; the laſt very much ſo. We meet with no coins of the kings of Arabia and Comagene except in braſs; thoſe of the kings of Boſphorus are in electrum, and a few in braſs, but all of them rare; as are likewiſe thoſe of Philetenis king of Pergamus and of the kings of Pontus. In the year 1777, a coin of Mithridates ſold for L.26, 5s. Didrachms of all kings and cities are ſcarce excepting thoſe of Corinth and her colonies; but the gold coins of Philip of Macedon, Alexander the Great and Lyſimachus, as has already been obſerved, are common. The ſilver tetradrachms of all kings bear a very high price. The didrachm of Alexander the Great is one of the ſcarceſt of the ſmaller Greek ſilver coins; ſome of the other princes are not uncommon.

96 Greek copper coins.

In moſt caſes the copper money of the Greek monarchs is ſcarce; but that of Hiero I. of Syracuſe is uncommonly plenty, as well as that of ſeveral of the Ptolemies.

97 Roman conſular coins.

The moſt rare of the conſular Roman coins are thoſe reſtored by Trajan: of the others the gold conſular coins are the moſt rare, and the ſilver the moſt common; excepting the coin of Brutus with the cap of Liberty already mentioned, with ſome others. Some of the Roman imperial coins are very ſcarce, particularly thoſe of Otho in braſs; nor indeed does he occur at all on any coin ſtruck at Rome: but the reaſon of this may with great probability be ſuppoſed to have been the ſhortneſs of his reign. His portrait upon the braſs coins of Egypt and Antioch is very bad; as well as almoſt all the other imperial coins of Greek cities. The beſt likeneſs is on his gold and ſilver coins; the latter of which are very common. The Greek and Egyptian coins are all of ſmall or middling ſize, and have reverſes of various kinds; thoſe of Antioch have Latin legends, as well as moſt of the other imperial coins of Antioch. They have no other reverſe but the SC in a wreath, excepting in one inſtance or two of the large and middle braſs, where the inſcriptions are in Greek. Latin coins of Otho in braſs, with figures on the reverſe, are certainly falſe; though in the cabinet of D'Ennery at Paris there was an Otho in middle braſs reſtored by Titus, which was eſteemed genuine by connoiſſeurs.

98 Leaden Roman coins.

The leaden coins of Rome are very ſcarce: Moſt of them are pieces ſtruck or caſt on occaſion of the ſaturnalia; others are tickets for feſtivals and exhibitions, both private and public. The common tickets for theatres were made of lead, as were the *contorniati*; perpetual tickets, like the Engliſh ſilver tickets for the opera. Leaden medallions are alſo found below the foundations of pillars and other public buildings, in order to perpetuate the memory of the founders. From the time of Auguſtus alſo we find that leaden ſeals were uſed. The work of Ticorini upon this ſubject, intitled *Piombi Antiochi*, is much recommended by Mr Pinkerton.

99 Of coins blundered in the mintage.

The Roman coins, which have been blundered in the manner formerly mentioned, are very rare, and undeſervedly valued by the connoiſſeurs. The blunders in the legends of theſe coins, which in all probability are the mere effects of accident, have been ſo far miſtaken by ſome medalliſts, that they have given riſe to imaginary emperors who never exiſted. A coin of Fauſtina, which has on the reverſe SOUSTI. S. C. puzzled all the German antiquaries, till at laſt Klotz gave it the following facetious interpretation: *Sine omni utilitate ſectamini tantas ineptias.*

100 Heptarchic coins of England.

The heptarchic coins of England are generally rare except thoſe call *ſtycas*, which are very common, as well as thoſe of Burgred king of Mercia. The coins of Alfred which bear his buſt are ſcarce, and his other money much more ſo. Thoſe of Hardyknute are ſo rare, that it was even denied that they had an exiſtence; but Mr Pinkerton informs us, that there are three in the Britiſh muſeum, upon all of which the name HARTHCANUT is quite legible. No Engliſh coins of King John are to be met with, tho' there are ſome Iriſh ones; and only French coins of Richard I. "Leake (ſays Mr Pinkerton) made a ſtrange blunder in aſcribing coins of different kings with two faces, and otherwiſe ſpoiled in the ſtamping, to this prince; in which, as uſual, he has been followed by a miſled number."

101 Scottiſh coins.

Coins of Alexander II. of Scotland are rather ſcarce, but thoſe of Alexander III. are more plentiful. Thoſe of John Baliol are rare, and none of Edward Baliol to be found.

SECT. IX *Of the Purchaſe of Medals.*

MEDALS are to be had at the ſhops of goldſmiths and ſilverſmiths, with thoſe who deal in curioſities, &c. but in great cities there are profeſſed dealers in them. The beſt method of purchaſing medals, however, is that of buying whole cabinets, which are every year expoſed to auction at London. In theſe the rare medals are ſold by themſelves; but the common ones are put up in large lots, ſo that the dealers commonly purchaſe them. Mr Pinkerton thinks it would be better that medals were ſold one by one; becauſe a lot is often valued and purchaſed for the ſake of a ſingle coin; while the others ſeparately would ſell for perhaps four times the price of the whole lot. "If any man of common ſenſe and honeſty (ſays Mr Pinkerton)

kerton) were to take up the trade of ſelling coins in London, he would make a fortune in a ſhort time. This profitable buſineſs is now in the hands of one or two dealers, who ruin their own intereſt by making an elegant ſtudy a trade of knavery and impoſition. If they buy 300 coins for 10s. they will aſk 3s. for one of the worſt of them! nay, ſell forged coins as true to the ignorant. The ſimpletons complain of want of buſineſs. A knave is always a fool."

102 Price of gold coins of Carthage, &c.

The gold coins of Carthage, Cyrene, and Syracuſe, are worth about twice their intrinſic value as metal; but the other gold civic coins from 5l. to 30l. each. The only gold coins of Athens certainly known to exiſt are two lately procured by the Britiſh king. One of theſe remains in poſſeſſion of his majeſty, but the other was given by the queen to Dr Hunter. There was another in the Britiſh muſeum, but ſuſpected not to be genuine. Dr Hunter's coin , then, if ſold, would bear the higheſt price that could be expected for a coin.

103 Of ſilver coins,

The ſilver coins of Syracuſe, Dyrrachium, Maſſilia, Athens, and a few other ſtates, are common ; the drachmas and coins of leſſer ſize are worth about five ſhillings ; the didrachms, tetradrachms, &c. from five to ten, according to their ſize and beauty ; the largeſt, as might naturally be expected, being more valuable than the ſmall ones. The tetradrachms, when of cities whoſe coins are common, are worth from 7s. 6d. to 1l. 1s. but it is impoſſible to put a value upon the rare civic coins ; ten guineas have been given for a ſingle one.

104 Greek copper coins.

The Greek copper coins are common; and are almoſt all of that kind called *ſmall braſs* ; the middle ſize being ſcarce, and the largeſt in all ages prior to the Roman emperors extremely ſo. The common Greek coins of braſs bring from 3d. to 18d. according to their preſervation ; but when of cities, whoſe coins are rare, much higher prices are given. "The want of a few cities, however (ſays Mr Pinkerton), is not thought to injure a collection ; as indeed new names are diſcovered every dozen of years, ſo that no aſſortment can be perfect. To this it is owing that the rarity of the Grecian civic coins is not much attended to."

105 Gold coins of Philip and Alexander.

The gold coins of Philip and Alexander the Great being very common, bear but from five to ten ſhilllings above their intrinſic value; but thoſe of the other princes, being rare, ſell from 3l. to 30l. each, or even more.

The tetradrachms are the deareſt of the ſilver monarchic money, ſelling from five to ten ſhillings ; and if very rare, from 3l. to 30l. Half theſe prices may be obtained for the drachmas, and the other denominations in proportion.

106 Greek copper coins rarer than the ſilver.

The Greek copper coins are for the moſt part ſcarcer than the ſilver, except the Syro-Græcian, which are common, and almoſt all of the ſize called ſmall braſs. "They ought (ſays Mr Pinkerton) to bear a high price ; but the metal and ſimilarity to the copper civic coins, which are common, keep their actual purchaſe moderate, if the ſeller is not well inſtructed, and the buyer able and willing to pay the price of rarity."

The name of weights given to the ancient Roman aſes is, according to our author exceedingly improper ; as that people had weights of lead and braſs ſides, without the leaſt appearance of a portrait upon them. Theſe denote the weight by a certain number of knobs ; and have likewiſe ſmall *fleurettes* engraved upon them. According to Mr Pinkerton, whenever we meet with a piece of metal ſtamped on both ſides with buſts and figures, we may lay it down as a certain rule that it is a coin ; but when ſlightly ornamented and marked upon one ſide only, we may with equal certainly conclude it to be a weight.

107 Price of the ancient Roman aſes.

The ancient Roman aſes are worth from 2s. to 2l. according to the ſingularity of their devices. Conſular gold coins are worth from 1l. to 5l. Pompey with his ſons 21l. and the two Bruti 25l. The ſilver coins are univerſally worth from a ſhilling to half a crown; excepting that of the cap of Liberty and a few others, which if genuine will bring from 10s. to 5l. The conſular copper bears an equal price with the ſilver, but is more rare ; the conſular ſilver coins reſtored by Trajan are worth 20s. each.

With regard to the Roman imperial coins, it is to be obſerved, that ſome of thoſe which belong to princes whoſe coins are numerous, may yet be rendered extremely valuable by uncommon reverſes. Mr Pinkerton particularly points out that of Auguſtus, with the legend C. MARIUS TROGVS, which is worth three guineas, though the ſilver coins of that prince in general are not worth above a ſhilling. In like manner, the common gold coins of Trajan are not worth above twenty ſhillings, while thoſe with *Baſilica Ulpia, Forum Trajani, Divi nerva et Trajanus, Pater, Divi Nerva et Plotina Aug. Profectio Aug. Regna Aſſignata, Rex Parthus*, and ſome others, bear from three to ſix pounds. The ticket medals belong to the Roman Senate, and are worth from three to ten ſhillings. The forged coins and medallions of the Paduan ſell from one to three ſhillings each.

108 Barbaric coins.

Of the coins of other nations, thoſe of Hilderic king of the Vandals are in ſilver, and worth 10 s. ; the ſmall braſs of Athanaric, 5 s. ; the gold of Theodoric 2 l. ; the ſecond braſs of Theodahat 5 s. ; the ſecond braſs of Badueta rare, and worth 10 s. ; the third braſs, 3 s. The Britiſh coins are very rare, and worth from ten ſhillings to two guineas each, ſometimes much more. Medals with unknown characters are always ſcarce and dear. Saxon pennies of the heptarchy are rare, and worth from ten ſhillings to *ten pounds*, according to their ſcarcity and preſervation. The coins of the Engliſh kings are common ; thoſe of Edward the Confeſſor, in particular ; others are rare and worth from ten ſhillings to two guineas, while two of Hardyknute are worth no leſs than ten guineas. The gold medals of Henry, in 1545, and the coronation of Edward, are worth 20l. each : the Mary of Trezzo, 3 l. ; Simon's head of Thurloe in gold is worth 12 l. ; his oval medal in gold upon Blake's naval victory at ſea is worth 30 l, ; and his trial piece, if brought to a ſale, would, in Mr Pinkerton's opinion, bring a ſtill higher price. The medals of Queen Anne, which are intrinſically worth about two guineas and a half, ſell for about 3 l. each ; the ſilver, of the ſize of a crown piece, ſell for 10 s. and the copper from five to ten ſhillings. Daſſier's copper pieces ſell from two to five ſhillings, and a few bear a higher price.

The Scottiſh gold coins ſell higher than the Engliſh

109
Gold coins of Scotland

liſh, but the others are on a par. The ſhilling of Mary with the buſt is rare, and ſells for no leſs than 30 l.; the half 3 l.; and the royal 5 l. 5 s. The French teſtoon of Francis and Mary brings 10 l. 10 s. and the Scottiſh one of Mary and Henry would bring 50 l. as would alſo the medal of James IV. The coronation medal of Francis and Mary is worth 20 l. Briot's coronation medal ſold in 1755 only for two guineas at Dr Mead's ſale; but would now bring 20 l. if ſold according to rarity.

110
Engliſh coins ſtruck in Ireland.

The Engliſh coins ſtruck in Ireland are of much the ſame price with thoſe of the native country; but the St Patrick's halfpence and farthings are rather ſcarce, and the rare crown of white metal is worth 4 l. The gun-money of James II. and all other Iriſh coins are very common.

Sect. X. *Arrangement of Medals, with the Inſtructions to be derived from them.*

HAVING thus given a full account of every thing in general relative to medals, we muſt come to ſome particulars reſpecting their arrangement, and the entertainment which a medalliſt may expect from the trouble and expence he is at in making a collection.

It has already been obſerved, that one of the principal uſes of medals is the elucidation of ancient hiſtory. Hence the arrangement of his medals is the firſt thing that muſt occur in the formation of a cabinet. The moſt ancient medals with which we are acquainted are thoſe of Alexander I. of Macedon, who began to reign about 501 years before Chriſt. The ſeries ought of conſequence to begin with him, and to be ſucceeded by the medals of Sicily, Caria, Cyprus, Heraclia, and Pontus. Then follow Egypt, Syria, the Cimmerian Boſphorus, Thrace, Bithynia, Parthia, Armenia, Damaſcus, Cappadocia, Paphlagonia, Pergamus, Galatia, Cilicia, Sparta, Præonia, Epirus, Illyricum, Gaul, and the Alps, including the ſpace of time from Alexander the Great to the birth of Chriſt, and which is to be accounted the third medallic ſeries of ancient monarchs. The laſt ſeries goes down to the fourth century, including ſome of the monarchs of Thrace, Boſphorus, and Parthia, with thoſe of Comagene, Edeſſa or Oſrhoene, Mauritania, and Judæa. A moſt diſtinct ſeries is formed by the Roman emperors, from Julius Cæſar to the deſtruction of Rome by the Goths; nay for a much longer period, were it not that towards the latter part of it the coins become ſo barbarous as to deſtroy the beauty of the collection. Many ſeries may be formed of modern potentates.

111
Diadem an ancient emblem of ſovereign authority.

By means of medals we can with great certainty determine the various ornaments worn by ancient princes as badges of diſtinction. The Grecian kings have generally the diadem, without any other ornament; and though in general the ſide of the face is preſented to view, yet in ſome very ancient Greek and Roman conſular coins, full faces of excellent workmanſhip are met with. On ſeveral coins alſo two or three faces are to be ſeen, and theſe are always accounted very valuable.

The diadem, which was no more than a ribbon tied round the head with a floating knot behind, adorns all the Grecian princes from firſt to laſt, and is almoſt an infallible mark of ſovereign power. In the Roman conſular coins it is ſeen in conjunction with Numa and Ancus, but never afterwards till the time of Licinius, the colleague of Conſtantine. Diocleſian, indeed, according to Mr Gibbon, firſt wore the diadem, but his portrait upon coins is never adorned with it. So great an averſion had the Romans to kingly power, that they rather allowed their emperors to aſſume the radiated crown, the ſymbol of divinity, than to wear a diadem; but after the time of Conſtantine it becomes common. The radiated crown appears firſt on the poſthumous coins of Auguſtus as a mark of deification, but in ſomewhat more than a century became common.

The laurel crown, at firſt a badge of conqueſt, was afterwards permitted by the ſenate to be worn by Julius Cæſar, in order to hide the baldneſs of his head. From him all the emperors appear with it on their medals, even to our own times. In the lower empire the crown is ſometimes held by a hand above the head, as a mark of piety. Beſides theſe, the naval, mural, and civic crowns, appear on the medals both of emperors and other eminent men, to denote their great actions. The laurel crown is alſo ſometimes worn by the Greek princes. The Arſacidæ of Parthia wear a kind of ſaſh round the head, with their hair in rows of curls like a wig. The Armenian kings have the *tiara*, a kind of cap which was eſteemed the badge of imperial power in the eaſt. Conical caps are ſeen on the medals of Xerxes, a petty prince of Armenia, and Juba the father, the former having a diadem around it.

112
Symbols of divinity of the coins of Alexander and his ſucceſſors.

The impious vanity of Alexander and his ſucceſſors in aſſuming divine honours is manifeſt on their medals, where various ſymbols of divinity are met with. Some of them have an horn behind their ear, either to denote their ſtrength, or that they were the ſucceſſors of Alexander, to whom this badge might be applied as the ſon of Jupiter Ammon. This, however, Mr Pinkerton obſerves, is the only one of theſe ſymbols which certainly denotes an earthly ſovereign, it being doubted whether the reſt are not all figures of gods.—According to Eckhet, even the horn and diadem belong to Bacchus, who invented the latter to cure his headachs; and, according to the ſame author, the only monarch who appears on coins with the horn is Lyſimachus. We are informed, however, by Plutarch, that Pyrrhus had a creſt of goats horns to his helmet; and the goat we know was a ſymbol of Macedon. Perhaps the ſucceſſors of Alexander wore this badge of the horn in conſequence. The helmet likewiſe frequently appears on the heads of ſovereigns, and Conſtantine I. has helmets of various forms curiouſly ornamented.

The diadem is worn by moſt of the Greek queens, by Orodaltis, daughter of Lycomedes, king of Bithynia; and though the Roman empreſſes never appear with it, yet this is more than compenſated by the variety of their head-dreſſes. Sometimes the buſt of an empreſs is ſupported by a creſcent, to imply that ſhe was the moon as her huſband was the ſun of the ſtate. The toga, or veil drawn over the face, at firſt implied that the perſon was inveſted with the pontifical office; and accordingly we find it on the buſts of Julius Cæſar, while Pontifex Maximus. It likewiſe implies the augurſhip, the augurs having a particular kind of gown called *læna*, with which they covered their heads when obſerving an omen. In latter times this implies only conſecration, and is common in coins of empreſſes. It is firſt met with on the coins of Claudius Gothicus as the mark of conſecration of an emperor. The *nimbus*, or glory, now appropriated to ſaints, has been already mentioned. It is as ancient as Auguſtus, but is not to be met with on many of the imperial medals, even after it began to be appropriated by them. There is a curious coin, which has upon the reverſe of the common piece with the head of Rome URBS ROMA, in large braſs, Conſtantine I. ſitting amidſt victories and genii, with a triple crown upon his head for Europe, Aſia, and Africa, with the legend SECURITAS ROMÆ.

113
Portraits upon medals.

In general only the buſt is given upon medals, though ſometimes half the body or more; in which latter caſe the hands often appear with enſigns of majeſty in them; ſuch as the globe ſaid to have been introduced by Auguſtus as a ſymbol of univerſal dominion; the ſceptre ſometimes confounded with the conſular ſtaff, a roll of parchment, the ſymbol of legiſlative power, and an handkerchief expreſſive of the power over the public games, where the emperor gave the ſignal. Some princes hold a thunderbolt, ſhowing that their power on earth was equal to that of Jupiter in Heaven; while others hold an image of Victory.

Medals likewiſe afford a good number of portraits of illuſtrious men; but they cannot eaſily be arranged in chronological order, ſo that a ſeries of them is not to be expected. It is likewiſe vain to attempt the formation of a ſeries of gods and goddeſſes to be found on ancient coins. Mr Pinkerton thinks it much better to arrange them under the ſeveral cities or kings whoſe names they bear. A collection of the portraits of illuſtrious men may likewiſe be formed from medals of modern date.

114
Reverſes of Greek and Roman coins.

The reverſes of ancient Greek and Roman coins afford an infinite variety of inſtruction and amuſement. They contain figures of deities at full length, with their attributes and ſymbols, public ſymbols and diverſions, plants, animals, &c. &c. and in ſhort almoſt every object of nature or art. Some have the portrait of the queen, ſon, or daughter of the prince whoſe image appears on the face or obverſe; and theſe are eſteemed highly by antiquaries, not only becauſe every coin ſtamped with portraits on both ſides is accounted valuable, but becauſe they render it certain that the perſon repreſented on the reverſe was the wife, ſon, or daughter of him who appears on the obverſe; by which means they aſſiſt greatly in the adjuſting of a ſeries. Some, however, with two portraits are common, as Auguſtus, the reverſe of Caligula; and Marcus Aurelius, reverſe of Antoninus Pius.

We find more art and deſign in the reverſes of the Roman medals than of the Greek: but, on the other hand, the latter have more exquiſite relief and workmanſhip. The very ancient coins have no reverſes, excepting a rude mark ſtruck into the metal reſembling that of an inſtrument with four blunt points on which the coin was ſtruck; and was owing to its having been fixed by ſuch an inſtrument on that ſide to receive the impreſſion upon the other. To this ſucceeds the image of a dolphin, or ſome ſmall animal, in one of the departments of the rude mark, or in an hollow ſquare; and this again is ſucceeded by a more perfect image, without any mark of the hollow ſquare. Some of the Greek coins are hollow in the reverſe, as thoſe of Caulonia, Crotona, Metapontum, and ſome other ancient cities of Magna Grecia. About 500 B. C. perfect reverſes appear on the Greek coins, of exquiſite relief and workmanſhip. "The very muſcles of men and animals (ſays Mr Pinkerton) are ſeen, and will bear inſpection with the largeſt magnifier as ancient gems. The ancients certainly had not eyes different from ours; and it is clear that they muſt have magnified objects. A drop of water forms a microſcope; and it is probable this was the only one of the ancients. To Greek artiſts we are indebted for the beauty of the Roman imperial coins; and theſe are ſo highly finiſhed, that on ſome reverſes, as that of Nero's decurſion, the *adventus* and *progreſſio* of various emperors, the *fundator pacis* of Severus, the features of the emperor, riding or walking, are as exact as on the obverſe. But though the beſt Greek artiſts were called to Rome, yet the Greek coins under the Roman emperors are ſometimes well executed, and always full of variety and curioſity. No Roman or Etruſcan coins have been found of the globular form, or indented on the reverſe like the early Greek. The firſt Greek are ſmall pieces of ſilver, while the Roman are larger maſſes of copper. The former are ſtruck; the latter caſt in moulds. The reverſes of the Roman coins are very uniform, the prow of a ſhip, a car, or the like, till about the year 100 B. C. when various reverſes appear on their conſular coins in all metals. The variety and beauty of the Roman imperial reverſes are well known. The medalliſt much values thoſe which have a number of figures; as the *Puellæ Fauſtinianæ*, of Fauſtina, a gold coin no larger than a ſixpence, which has 12 figures: that of Trajan, *regna aſſignata*, has four; the *congiarium* of Nerva five; the allocution of Trajan ſeven; of Hadrian 10; of Probus 12. Some Roman medals have ſmall figures on both ſides, as the *Apolloni ſancto* of Julian II. Such have not received any peculiar name among the medalliſts. Others have only a reverſe, as the noted *ſpintriati*, which have numerals I. II. &c. on the obverſe."

115
Of the deities repreſented upon ancient coins.

The *names* of the deities repreſented on the reverſes of Greek coins are never expreſſed; perhaps, as Mr Pinkerton ſuppoſes, out of piety, a ſymbolical repreſentation of their attributes being all that they thought proper to delineate; but the Roman coins always expreſs the name, frequently with an adjunct, as VENERI VICTRICI, &c. In others, the name of the emperor or empreſs is added; as PUDICITIÆ AUGUSTÆ, round an image of Modeſty; VIRTUS AUGUSTI, a legend for an image of Virtue.

The principal ſymbols of the divine attributes to be met with on the Greek medals are as follow:

1. Jupiter is known on the coins of Alexander the Great by his eagle and thunderbolts; but when the figure occurs only on the obverſe of coins, he is diſtinguiſhed by a laurel crown, and placid bearded countenance. Jupiter Ammon is known by the ram's-horn twiſting round his ear; a ſymbol of power and ſtrength, aſſumed by ſome of the ſucceſſors of Alexander the Great, particularly by Lyſimachus.

Arrangement, &c.

2. Neptune is known by his trident, dolphin, or being drawn by ſea-horſes; but he is ſeldom met with on the Grecian coins.

3. Apollo is diſtinguiſhed by an harp, branch of laurel, or tripod; and ſometimes by a bow and arrows. In the character of the Sun, his head is ſurrounded with rays; but when the buſt only occurs, he has a fair round face, and is crowned with laurel. He is frequent on the coins of the Syrian princes.

4. Mars is diſtinguiſhed by his armour, and ſometimes by a trophy on his ſhoulders. His head is armed with a helmet, and has a ferocious countenance.

5. Mercury is repreſented as a youth, with a ſmall cap on his head, wings behind his ears and on his feet. He is known by the cap, which reſembles a ſmall hat, and the wings. He appears alſo with the caduceus, or wand twined with ſepents, and the *marſupium*, or purſe, which he holds in his hand.

6. Æſculapius is known by his buſhy beard, and his leaning on a club with a ſerpent twiſted round it. He ſometimes occurs with his wife Hygeia or Health, with their ſon *Teleſphorus* or Convaleſcence between them.

7. Bacchus is known by his crown of ivy or vine, his diadem and horn, with a tyger and ſatyrs around him.

8. The figure of Hercules is common on the coins of Alexander the Great, and has frequently been miſtaken for that of the prince himſelf. He appears ſometimes as a youth and ſometimes with a beard. He is known by the club, lion's ſkin, and remarkable apparent ſtrength; ſometimes he has a cup in his hand, and a poplar tree, as a ſymbol of vigour, is ſometimes added to the portrait.

9. The Egyptian Serapis is known by his buſhy beard, and a meaſure upon his head.

10. Apis is delineated in the form of a bull, with a flower of the lotos, the water lilly of the Nile, ſuppoſed by Macrobius to be a ſymbol of creation and Jamblichus tells us, that Oſiris was thought to have his throne in it.

11. Harpocrates, the god of Silence, appears with his finger on his mouth; ſometimes with the ſiſtrum in his left hand; a ſymbol common to moſt of the Egyptian deities.

12. Canopus, another Egyptian deity, appears in the ſhape of a human head placed on a kind of pitcher. "This deified pitcher (ſays Mr Pinkerton) ſeems to refer to an anecdote of ancient ſuperſtition, which, I believe, is recorded by Plutarch. It ſeems ſome Perſian and Egyptian prieſts had a conteſt which of their deities had the ſuperiority. The Egyptian ſaid, that a ſingle vaſe, ſacred to Serapis, would extinguiſh the whole power of the Perſian deity of fire. The experiment was tried; and the wily Egyptian, boring holes in the vaſe and ſtopping them with wax, afterwards filled the vaſe with water; which, guſhing through the holes as the wax melted, extinguiſhed the Perſian deity. Hence the vaſe was deified."

13. The *Holy Senate* and *Holy People*, appear frequently on Greek imperial coins, ſometimes repreſented as old men with beards, at others as youths.

The goddeſſes repreſented on medals are,

1. Juno, repreſented by a beautiful young woman, ſometimes with a diadem, ſometimes without any badge, which is reckoned a ſufficient diſtinction, as the other goddeſſes all wear badges. Sometimes ſhe appears as the goddeſs of marriage; and is then veiled to the middle and ſometimes to the toes. She is known by the peacock, a bird ſacred to her from the fable of Argus.

Arrangement, &c.

2. Minerva is very common on the coins of Alexder the Great; and her buſt has been miſtaken by the celebtated painter Le Brun for the hero himſelf. She is very eaſily diſtinguiſhed by the helmet. Her ſymbols are, her armour; the ſpear in her right hand, and the ægis, with a Meduſa's head, in her left; an owl commonly ſtanding by her.

3. Diana of Epheſus is commonly repreſented on the Greek imperial coins; and appears with a great number of breaſts, ſuppoſed to denote univerſal nature. She is ſupported by two deer, and carries a pannier of fruit upon her head. The buſt of this goddeſs is known by the creſcent on her brow, and ſometimes by the bow and quiver at her ſide

4. Venus is known by an apple, the prize of beauty, in her hand. Sometimes ſhe is diſtinguiſhed only by her total want of dreſs; but is always to be known by her extraordinary beauty, and is ſometimes adorned with pearls about the neck.

5. Cupid is ſometimes met with on the Syrian coins, and is known by his infancy and wings.

6. Cybele is known by a turreted crown and lion; or is ſeen in a chariot drawn by lions.

7. Ceres is known by her garland of wheat, and is common on the Sicilian coins; that iſland being remarkable for its fertility. Sometimes ſhe has two ſerpents by her, and is ſometimes drawn in a chariot by them. She carries in her hands the torches with which ſhe is fabled to have gone in ſearch of her daughter Proſerpine.

8. Proſerpine herſelf is ſometimes met with on coins with the name of κορη or the *girl*.

1. The Egyptian Iſis has a bud or flower on her head; a ſymbol of the perpetual bloom of the inhabitants of heaven. She carries alſo a ſiſtrum in her hand.

10. The Sidonian Aſtarte appears on a globe ſupported on a chariot with two wheels, and drawn by two horſes.

Theſe are the deities moſt commonly repreſented on the Greek coins. The more uncommon are, Saturn with his ſcythe, or with a hook on the Heraclian coins; Vulcan with his tongs, on the reverſe of a coin of Thyatira, repreſented at work in the preſence of Minerva. Adranus, a Sicilian god, is ſomteimes repreſented on coins with a dog. Anubis, an Egyptian deity, has a dog's head. Atis is known by his Phrygian bonnet; Caſtor and Pollux by a ſtar on the head of each; Dis, by his old face, diſhevelled hair and beard, and a hook; Flora by her crown of flowers; Nemeſis by her wheel; and Pan by his horns and ears belonging to ſome kind of beaſt.

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Table of Symbols.

There are likewiſe to be found on medals many different ſymbols by themſelves; of the moſt remarkable of which we ſhall give the following table, with their ſignifications:

Symbols.	Signification.
1. Vaſes with ſprigs,	Solemn games,

Arangement, &c.

Symbols.	Signification.
2. Small cheſt or hamper, with a ſerpent leaping out,	Myſtic rites of Bacchus.
3. Anchor on Selucian medals,	Coin ſtruck at Antioch, where an anchor was dug up.
4. Apollo on Syrian coins, on an inverted hamper.	Covered tripod.
5. Bee,	Ariſteus the Son of Apollo.
6. Laurel,	Apollo.
7. Reed,	A river.
8. Ivy and grapes,	Bacchus.
9. Poppy,	Ceres and Proſerpine.
10. Corn,	Ceres.
11. Owl and olive,	Minerva.
12. Dove,	Venus.
13. Torch,	Diana, Ceres, Or Proſerpine.
14. Mudnis, or conic ſtone,	The ſun, Belus, or Venus.
Symbols of Countries, &c.	
15. Pomegranate flowers,	Rhodes.
16. Owl,	Athens.
17. Pegaſus,	Corinth.
18. Wolf's head,	Argos.
19. Bull's head,	Bœotia.
20. Minotaur's head and labyrinth,	Crete.
21. Horſe's head,	Pharſalia.
22. Lion,	Marſeilles.
23. Tortoiſe,	Peloponneſus.
24. Sphinx,	Scio.
25. Three legs joined, as in the Iſle of Man-money,	Sicily.
26. Horſe,	Theſſaly.
27. The creſcent,	Byzantium(A)
28. Bull,	Suppoſed to be a river.
29. Enſign, with the letters COL.	A colony drawn from one legion.
30. Bull,	Apis, ſtrength or ſecurity.
31. Caduceus,	Peace and concord.
32. Cornucopia,	Abundance.
33. Pontificial hat,	Prieſthood.
34. Parazonium,	Baton of command.
35. Globe on an altar with three ſtars.	The world preſerved by the gods for the three ſons of Conſtantine I.
36. Fort and gate,	Security.
37. Tribuli, a kind of Chevaux de Frize,	Unknown.
38. Altar or tripod,	Piety.
39. Dolphin,	Apollo.
40. Lectiſternia,	Feſtivals.
41. Mituus, or twiſted wand,	Augurſhip.
42. Apex, or cap with ſtrings,	Pontificate.
43. Thenſa, or chariot employed to carry images,	Conſecration of an empreſs.
44. Peacock,	Ditto.
45. Eagle,	Conſecration of an emperor.

117 Legends of Medals.

The legends put upon medals are deſigned as explanations of them; but as the compaſs of even the largeſt coins does not admit of any great length of inſcription, it has always been found neceſſary to uſe abbreviations; and in readily decyphering theſe lies a conſiderable part of the difficulty of the ſcience. This, however, is greater in the Roman than in the Greek medals; for the Greeks commonly inſert as much of the word as is ſufficient to enable us eaſily to underſtand its meaning; but it is common for thoſe who attempt to explain letters that do not often occur, to fall into very ridiculous errors. Of this Mr Pinkerton gives a moſt remarkable inſtance in Fortunius Licetus, a learned man, who finding upon a coin of Adrian the letters Γ. ΙΔ. ſignifying the 14th year of that emperor's reign, imagined that they ſignified *Lucernas invenit Delta;* "Delta invented lanthorns;" and thence aſcribed the origin of lanthorns to the Egyptians. Tables explaining the meaning of the Abbreviations found upon medals have been publiſhed by Patin, Urſatus, and others.

118 Extraordinary miſtake of Fortunius Licetus.

Sect. XI. *Of Medallions, Medalets, &c.*

Besides the ordinary coins of the ancients, which paſſed in common circulation through the country, there were others of a larger ſize, which are now termed *medallions*. Theſe were ſtruck on the commencement of the reign of a new emperor and other ſolemn occaſions: frequently alſo, by the Greeks in particular, as monuments of gratitude or of flattery. Sometimes they were mere trial or pattern pieces; and thoſe abound after the time of Maximian with the words *Tres Monetæ* on the reverſe. The common opinion is,

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(A) This appears on the early coins of Byzantium, with the legend ΒΥΖΑΝΤΙΝ ΣΩΤ. "the preſerver of Byzantium." The reaſon of this was, that when Philip of Macedon beſieged the city, and was about to ſtorm it in a cloudy night, the moon ſhone out on a ſudden and diſcovered him; by which means the inhabitants had time to collect their forces and repulſe him. The Turks, on entering Conſtantinople, found this badge in many places: and ſuſpecting ſome magical power in it, aſſumed the ſymbol and its power to themſelves; ſo that the creſcent is now the chief Turkiſh enſign.

is, that all the Roman pieces of gold exceeding the denarius aureus, all in ſilver exceeding the denarius, and all in braſs exceeding the ſeſtertius, went under the denomination of *medallions*: but Mr Pinkerton thinks that many of theſe large pieces went in circulation, though not very commonly, as the five and two guinea pieces, ſilver crowns, &c. do in Britain. The fineſt medallions were preſented by the mint-maſters to the emperor, and by the emperor to his friends, as ſpecimens of fine workmanſhip. The beſt we have at preſent are of braſs, and many of them compoſed of two ſorts of metal; the centre being copper, with a ring of braſs around it, or the contrary: and the inſcription is ſometimes confined to one of the metals, ſometimes not. There is a remarkable difference between the Greek and Roman medallions in point of thickneſs; the latter being frequently three or four lines thick, while the other ſeldom exceed one. Very few medallions, however, were ſtruck by the Greeks before the time of the Roman emperors; but the Greek medallions of the emperors are more numerous than thoſe of the Romans themſelves. All theſe pieces, however, are of ſuch high price that few private perſons are able to purchaſe them. In the laſt century Chriſtina queen of Sweden procured about 3000. In the king of France's collection there are 1200: a number formerly ſuppoſed not to exiſt; and Dr Hunter's collection contains about 400, excluſive of the Egyptian.

Beſides theſe large pieces, there are ſmaller ones of a ſize ſomewhat larger than half-crowns; and by Italian medalliſts are called *medaglion cini*, or ſmall medallions. They are ſtill ſcarcer than the large kind.

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Of medalets.

There is ſtill a third kind, which have almoſt eſcaped the notice of medalliſts, viz. the ſmall coins or *miſſilia* ſcattered among the people on ſolemn occaſions; ſuch as thoſe ſtruck for the ſlaves on account of the ſaturnalia; counters for gaming; tickets for baths and feaſts; tokens in copper and in lead; &c. Theſe are diſtinguiſhed by Mr Pinkerton by the name of *medalets*. Many, or perhaps almoſt all, of thoſe ſtruck for the ſaturnalia, were ſatyrical; as the ſlaves had then a licence to ridicule not only their maſters but any perſon whatever. Mr Pinkerton mentions one of the moſt common pieces of this kind, which has on the obverſe the head of an old woman veiled, with a laurel crown; the reverſe only s. c. within a wreath. Baudelot is of opinion that it is the head of Acca Laurentia, the nurſe of Romulus, to whom a feſtival was ordained. "Perhaps (ſays Mr Pinkerton), it was ſtruck in ridicule of Julius Cæſar; for the manner of the laurel crown, and its high appearance over the head, perfectly reſemble that of Julius on his coins." Some have a ſhip upon one ſide; on the reverſe T, or a croſs, which was the image of Priapus; and occaſioned many falſe invectives againſt the firſt Chriſtians, who paid ſuch reſpect to the croſs. Some pieces have the heads of the emperors upon one ſide; on the reverſe only numerals III. IV. V. &c. and the noted *ſpintriati* of Tacitus. Both theſe kinds appear to be tickets for the baths, as the number ſeems to denote the particular bath. Some have the head of a girl, with a veſſel uſed at the baths in her hand. The ſpintriati are ſo immodeſt, that few will bear mention. But ſome are merely ludicrous; as one which has an aſs with a bell about his neck, and a ſoldier riding him; another with two figures hoiſting a woman in a baſket into the air. Of thoſe that will juſt bear mention, is a man with titles around him, as chief of the games; and a woman in ridicule of the modeſt bath-girl abovementioned. There is alſo one marked xix, on which appears an imperator triumphing in a car; this car is placed on the back of a camel; and behind the imperator is a monkey mimicking him.

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Of the contorniati,

A fourth claſs of medals are called *contorniati* from the Italian *contorniato*, "encircled;" becauſe of the hollow circle which commonly runs around them. They are diſtinguiſhed from medallions by their thinneſs, faint relief, reverſes ſometimes in relief, ſometimes hollow; and in general by the inferiority in their workmanſhip. The opinions of medalliſts concerning theſe pieces are very various; ſome ſuppoſe them to have been ſtruck by Gallienus to the memory of illuſtrious men and celebrated *athletæ*, at the time that he cauſed all the conſecrated coins of his predeceſſors to be reſtored; others aſcribe their invention to Greece, &c. but Mr Pinkerton is of opinion that they were only tickets for places at public games. Many of them, notwithſtanding their inferior workmanſhip, are very valuable on account of their preſerving the portraits of ſome illuſtrious authors of antiquity, no where elſe to be found. Much dependance, however, cannot be put on the portraits of Greek authors and eminent men found upon ſome of them; for though we know that the buſts of Salluſt, Horace, &c. muſt have been ſtruck when their perſons were freſh in the memory of the artiſts, yet it was otherwiſe with Homer, Solon, Pythagoras, &c. which are to be found in ſome of them. Even theſe, however, are valuable, as being ancient and perhaps traditional portraits of theſe great men. The laſt whoſe portraits are ſuppoſed to have been delineated in this way, are Apollonius Tyaneus who flouriſhed in the time of Domitian, and Apuleius in that of Marcus Antoninus. Mr Pinkerton thinks it a confirmation of his opinion concerning theſe medals, that the reverſes always contain ſome device alluding to public games, as that of a charioteer driving a chariot, &c.

Sect. XII. *Directions for Making Cabinets*

We muſt now proceed to the laſt part of our ſubject, viz. that of giving directions for the formation of cabinets. As we have already ſeen that the formation of any one muſt be attended with very conſiderable expence, it is neceſſary for every one who attempts this to proportion the cabinet to his own circumſtances. There are, properly ſpeaking, three kinds of cabinets. 1. Thoſe meant to contain a coin of every ſort that has been iſſued from the mint in every age and country; but this, which may be called the large and complete cabinet, is not to be purchaſed by private perſons. That of Dr Hunter already mentioned is perhaps one of the beſt private cabinets ever known; and coſt 23,000l. but as many duplicates were ſold as coſt 2000l. by which means the expence was reduced to 21,000. The vaſt collection made by the king of France coſt upwards of 100,000l. The

Directions for making cabinets:

Directions for making cabinets.

ſmaller cabinet may be ſuppoſed to conſiſt only of middle and ſmall Roman braſs, Engliſh pennies, groats, &c. with a few medals of the more valuable kind, and may be ſuppoſed to incur an expence of from 200 to 1000l. The ſmalleſt kind is called a *caſket* of medals and does not conſiſt of above a thouſand at moſt of various kinds; and conſequently the expence muſt depend on the pleaſure of the proprietor.

In the formation of the grand cabinet, it muſt be obſerved that the Greek medals of every denomination do not admit of any arrangement by the metals like the Roman; not any regular ſeries of this kind being met with even in the moſt opulent cabinets. Hence in all collections the civic coins are ranged according to an alphabetical order; and the monarchic in a chronological one. The ſame rule is to be obſerved in the Roman conſular medals; they are ranged, like the coins of the Greek cities, in the alphabetical ſeries of the families. The Roman imperial coins are only thoſe capable of being arranged according to ſizes and metals. Even from this muſt be excepted the minimi, or very ſmalleſt coins; which are ſo ſcarce, that the only regular ſeries of them in the world is that belonging to the king of Spain, which was formed by a moſt ſkilful French medalliſt, and conſiſts of all the metals. The arangement of a grand cabinet, according to Mr Pinkerton, is as follows.

"I. The coins of cities and of free ſtates in alphabetical order: whether uſing Greek, Roman, Punic, Etruſcan, or Spaniſh characters.

"II. Kings in chronological ſeries, both as to foundation and ſeniority of reign.

"III. Heroes, heroines, founders of empires, and cities.

"IV. Other illuſtrious perſons.

"V. Roman aſes.

"VI. Coins of families, commonly called conſular.

"VII. Imperial medallions.

"VIII. Imperial gold.

"IX. Imperial *minimi* of all metals.

"X. Imperial ſilver.

"XI. Imperial firſt braſs.

"XII. Second braſs..

"XIII. Third braſs.

"XIV. Colonial coins, which are all of braſs.

"XV. Greek cities under the emperors, of all metals and ſizes. In a ſmaller cabinet they may be put with the Roman, according to their metal and ſize. Thoſe without the emperor's head go to claſs I. though ſtruck in Roman times.

"XVI. Egyptian coins ſtruck under the Roman emperors, of all metals and ſizes. They are moſtly of a baſe metal called by the French *patin*; it is a kind of pot metal or brittle braſs.

"XVII. Contorniati, or ticket medals.

"XVIII. Coins of Gothic princes, &c. inſcribed with Roman characters.

XIX. Coins of ſouthern nations uſing uncommon alphabets; as the Perſian, Punic, Etruſcan, and Spaniſh.

"XX. Coins of northern nations uſing uncommon characters, as the Punic and German.

"In the modern part no ſeries can be formed of copper that will go back above two centuries; but ſequences (chronological ſeries) of gold and ſilver may be arranged of all the different empires, kingdoms, and ſtates, as far as their ſeveral coinages will allow. Thoſe of England and France will be the moſt perfect. Modern ſilver is commonly arranged in three ſequences; the dollar, the groat, and the penny ſizes. The medals of each modern country ought of courſe to be ſeparated; though it is beſt to arrange each ſet in chronological order, let their ſize of metal be what they will. It may be remarked here, that modern medals, of the ſize of a tea-ſaucer, are only ſo many monuments of barbariſm. The ancient medallions are almoſt univerſally but litttle larger than our crown-piece, though three or four of them may extend to about two inches diameter, but very many modern medals to four inches and more. A large medal always declares an ignorant prince or an ignorant artiſt. Into the ſize of a crown-piece the ancients threw more miracles in this way than will ever appear in theſe monſtrous productions."

Theſe directions will likewiſe apply to the formation of a cabinet of the ſecond kind; but if the collector means to form a ſeries of large Roman braſs, he will find the coins of four or five emperors ſo ſcarce as not to be attainable in that ſeries, even at any price. He muſt therefore ſupply their places with middle braſs, as is allowed with regard to Otho; even in the beſt cabinets, there not being above three coins of that emperor in large braſs known in the world: whereas of the middle braſs, two or three hundred may exiſt. For this reaſon Mr Pinkerton concludes, that in cabinets of the ſecond claſs, the collector may mingle the large and ſecond braſs together as he thinks proper, in order to ſave expence; though it would not do ſo well to unite ſuch diſproportionate ſizes as the large and ſmall. "In the ſmall ſequence, however (ſays he), there can be no harm in his mixing gold, ſilver, and braſs, as chance or curioſity may lead him to purchaſe any of theſe metals. And tho' your ſtarched bigotted medalliſt may ſneer becauſe ſuch a ſequence would controvert his formal and narrow way of thinking, common ſenſe will authoriſe us to laugh at the pedant in our turn, and to pronounce ſuch a ſeries more various, rich, and intereſting, than if the collector had arranged only one metal, and rejected a curious article becauſe he did not collect gold or ſilver. In like manner, if, in the modern part of the ſmaller cabinet, any coin of a ſeries is of high price, or of bad impreſſion, there can be no impropriety in putting another of the ſame reign, which is cheaper, or better executed, though of a different denomination or of a little larger ſize. In ſhort, the collector has no rules but in the Greek cities and Roman families, to obſerve alphahetical order and chronology in every thing elſe.

TABLES of ancient Coins.

The moſt ancient coins, according to Froelich, are diſtinguiſhed by the following marks, which he accounts infallible. 1. Their oval circumference, and globulous ſwelling ſhape. 2. Antiquity of alphabet. 3. The characters being retrograde, or the firſt diviſion of the legend in the common ſtyle, while the next is retrograde. 4. The indented ſquare already deſcribed. 5. The ſimple ſtructure of the mintage. 6. Some of the very old coins are hollowed on the reverſe, with the image impreſſed on the front. 7. The dreſs, ſymbols, &c. frequently of the rudeſt deſign and execution.

Table I. *Ancient Greek Coins.*

1. Thoſe without impreſſion.

2. With one or more hollow indented marks on one ſide, and an impreſſion in relief on the other.—Of Chalcedon on the Helleſpont, Leſbos, Abdera, in Thrace, Acanthus in Macedon, thoſe ſaid to belong to Egium in Achaia. This claſs continues from about 900 to 700 B. C.

3. With an indented ſquare divided into ſegments, having a ſmall figure in one of them; the reſt blank, with a figure in relief on the obverſe.—Of Syracuſe and other places adjacent.—Continue from 700 to 600 B. C.

4. Coins hollow on the reverſe, with figures in relief on the obverſe.—Of Caulonia, Crotona, Metapontum, &c. Suppoſed by ſome to be a local coinage of Magna Gæcia; but probably of equal antiquity with the former.

5. Coins in which a ſquare dye is uſed on one or both ſides.—Of Athens, Cyrene, Argos, &c.—Of Alexander I. and Archelaus I. of Macedon. Diſuſed in the reign of the latter about 420 B. C.

6. Complete coins, both in obverſe and reverſe, occur firſt in Sicily in the time of Gelo, about 491 B. C.

7. Coins of Alexander the Great and his ſucceſſors. About the time of this hero the Greek coins began to attain to perfection, and were ſtruck of uncommon beauty. It is remarkable, that on the coins of this monarch his own image ſeldom occurs. The only one yet found of Alexander with his portrait upon it, and ſtruck during his reign, is a ſilver hemidrachm in Dr Hunter's cabinet, which is repreſented Plate CCXCII. n° 3. After his death many coins bear his portrait. Trebellius Pollio informs us, that ſome coins, particularly thoſe of Alexander, uſed to be worn as amulets; and many medals are met with in cabinets bored ſeemingly with that intention.

8. Coins of the ſucceſſors of Alexander.—Thoſe of the Syrian monarchs almoſt equal the coins of Alexander himſelf in beauty. Thoſe of Antiochus VI. are ſuppoſed to be the moſt perfect patterns of male beauty to be met with any where. The Egyptian Ptolemies are ſomewhat inferior.

9. The coins of the Arſacidæ of Parthia done by Greek workmen.

10. The Greek imperial coins, being ſuch as have the head of an emperor or empreſs: ſuch as have not theſe impreſſions being claſſed with the civic coins, though ſtruck under the Roman power. None of the imperial coins occur in gold. Of ſilver there are thoſe of Antioch, Tyre, Sidon, Tarſus, Berytus, Cæſarea. Egyptian ſilver coins of baſe metal. Syrian ſilver coins, which ſometimes bear on the reverſe the club of Hercules, or the Tyrian ſhell-fiſh. Thoſe of Sidon bear the image of the goddeſs Aſtarte, or her chariot. Thoſe of Cæſarea in Cappadocia of better work than the Syrian. Lycian coins of good workmanſhip; on the reverſe two harps and an owl ſitting upon them. Silver coins of Gelon in Sarmatia reſembling the Syrian. The ſituation of this town is very much unknown. It ſeems to have been ſituated on the north of the Euxine ſea where ſome Sarmatic or Sclavonic tribes were mingled with the Scythians or Goths. The Greek imperial braſs coins are very numerous. A ſeries of almoſt all the emperors may be had from thoſe of Antioch, with a Latin legend on the obverſe and Greek on the reverſe. Thoſe of Bithynia and Phrygia remarkable for good workmanſhip. The coins of Tarſus remarkable for their curious views of objects, almoſt in perſpective. The Egyptian coins, from the time of Auguſtus to Nero are worſe executed than afterwards. From Nero to Commodus they are frequently of admirable workmanſhip, and in a peculiar ſtyle diſtinct both from the Geeek and Roman. From the time of Commodns they decline, and are loſt after the reign of Conſtantius I. The Egyptian braſs coins of the Roman period are likewiſe of excellent workmanſhip, eſpecially in the time of Antoninus Pius.

Table II. *Roman Coins.*

I. The conſular coins, called alſo the coins of families, and arranged alphabetically in cabinets, according to the names of the families which appear on them. They are,

1. *Braſs coins.*—Theſe conſiſt chiefly of large pieces of rude workmanſhip without any intereſting imagery. In cabinets they are generally kept in boxes apart by themſelves. The as bears the head of Janus; the ſemis of Jupiter with S; the triens of Minerva with four ciphers; the quadrans of Hercules with three ciphers; the ſextans of Mercury with two ciphers; and the uncia bears the head of Rome with one cipher. In all theſe pieces the prow of a ſhip is conſtantly the figure on the reverſe, with very few exceptions. Sometimes, indeed, they have a ſhell, two heads of barley, a frog, an anchor, or a dog, on the reverſe. About the time of Julius Cæſar both the obverſes and the reverſes of the coins began to be altered.

2. *Silver.* Of this the denarius was the firſt and principal coin. It was ſtamped originally with X, denoting that the value was ten aſes. On the reverſe was Caſtor and Pollux, or a chariot of victory. Afterwards the buſts of various deities make their appearance; and in the ſeventh century of Rome the portraits of illuſtrious perſons deceaſed are met with: but till the time of Julius Cæſar no figure of any living perſon is to be met with; Julius himſelf being the firſt who aſſumed that honour. The workmanſhip on the beſt and worſt ſilver is much the ſame. The reverſes are very curious, and point out many remarkable events in Roman hiſtory; but none of theſe occur till about a century before the chriſtian era. The large denarii, with Roma, are the moſt ancient; and ſome of theſe bear the Pelaſgic A, not the Roman. The ſilver ſeſtertii have a head of Mercury, with a caduceus on the reverſe. The quinarii have always a head of Jupiter, with a victory on the reverſe

3. *Gold.*—Moſt of theſe are of great value. The number of theſe exceeds not 100; thoſe of braſs 200; and of ſilver 2000. The aureus is the general gold coin; but two or three gold ſemiſſes of families likewiſe occur.

Ancient coins.

II. Roman imperial coins.

1. *Braſs.*—This is of three ſizes, large, middle, and ſmall. The firſt forms a moſt beautiful ſeries, but very expenſive. The various colours of the patina have the fineſt effect. It is the moſt important of all the Roman coins, and exceeds even the gold in value.

The middle braſs is next in value to the former; and in it are many rare and curious coins, particularly intereſting to Britons, as elucidating the hiſtory of the iſland. Of theſe are the triumphal arch of Claudius; the Exerc. Britannicus of Adrian; the coins of Antoninus Pius, Commodus, Severus, with a Victory, Victoria Britan.: but eſpecially thoſe perſonifying the country Britannia. "The number of Roman coins relating to Britain (ſays Mr Pinkerton) is remarkable, more than 20 having been ſtruck at various times; while thoſe perſonifying Italy, Gaul, Spain, and other regions of the empire, exceed not four or ſix at moſt for each country. Only one country vies with Britain, and that is Dacia on the extreme north-eaſt of the empire, as Britain on the extreme north-weſt. No doubt this circumſtance of remoteneſs in theſe two countries recommended them to this particular attention, as more expreſſive of the Roman power.

The ſmall braſs ſeries abounds alſo with curious coins. They are ſcarce till the time of Valerian and Gallienus, but very common afterwards. Mr Pinkerton recommends, therefore, to form a ſeries in ſilver as well as braſs; both being the cheapeſt of all the Roman coins. "In this ſeries (ſays he), it is a common fault to arrange many coins which have been plated with gold or ſilver, the forgeries of ancient times, but which time has worn off either wholly or in part. All real braſs coins have the s. c. till the time of Gallienus; as the ſenate alone had the power of ſtriking braſs, while the emperor himſelf had that of gold and ſilver. When the s. c. therefore, is wanting, the coin was certainly once plated; as, in general, the different type and fabric, being thoſe of gold and ſilver, ſufficiently ſhow themſelves. With Pertinax, A. D. 192, there is a temporary ceſſation of ſmall braſs; nor after him do any princes occur in that ſeries till Valerian, A. D. 254, excepting Trajanus Decius, A. D. 250 only. After Valerian the ſeries is continuous and common. The braſs coinage gradually declined in ſize from the time of Severus; ſo that parts of the as could not be ſtruck, or at leaſt it was held unneceſſary to ſtrike them. Trajanus Decius attempted in vain to reſtore the coinage; and Valerian and Gallienus were forced to iſſue denarii ærei and ſmall aſſaria. The ſeries of large and of middle braſs are of two fixed and known ſizes; the former about that of the crown, the latter of the half crown: though after Severus they gradually leſſen. But the ſmall braſs takes in all parts of the as; and every braſs coin not larger than a ſhilling belongs to this ſeries. The *minimi*, indeed, or very ſmalleſt, it is proper to keep apart. The coins of Julius Cæſar in this ſize are of peculiar fine workmanſhip. They bear his portrait reverſe of Auguſtus or the reverſe has a crocodile Egypto capta. There are ſeveral with Mark Anthony, and ſome with Cleopatra; but the more common pieces are thoſe with only numerals on the obverſe, which go the length of XIII; probably tickets for the baths. A great many occur in the time of Nero; of which Mr Pinkerton particulariſes one which has "on the reverſe a table ornamented with griffins and other devices. Upon it is placed a wreath of laurel; and a beautiful vaſe, of which the emboſſed human figures are ſo minute, and finiſhed ſo ſurpriſingly, as to ſtamp theſe coins the moſt exquiſite productions of the ancient mint." From the time of Nero to that of Veſpaſian no ſmall braſs occurs; but there are many of this emperor and of his ſon Titus; while Domitian has as many as Nero, and Domitia his wife has almoſt as many. Succeeding emperors to the time of Pertinax have alſo many braſs coins; but from his time to that of Valerian there are no real ſmall braſs, excepting thoſe of Trajanus Decius. After Gallienus there are a great many coins of this kind; and Mr Pinkerton mentions one in Dr Hunter's cabinet, of an unknown perſon named Nigrianus. The coin ſeems to have been ſtruck at Carthage; and our author concludes that he was an African Uſurper, father to Nigrinianus.

Ancient coins.

2. *Silver.*—This ſeries is very complete, and the cheapeſt of any; eſpecially as the ſmall braſs becomes a fine ſupplement to it; the latter being had in plenty when the ſilver becomes ſcarce, and the ſilver being plentiful when the braſs was ſcarce.

3. *Gold.*—The Roman imperial gold coins form a ſeries of great beauty and perfection; but on account of their great price are beyond the purchaſe of private perſons.

4. *The colonial coins* occur only in braſs, none, excepting that of Nemauſus, having a right to coin ſilver. They begin in Spain with Julius Cæſar and Anthony, and ceaſe with Caligula, who took away the privilege of coinage from the Spaniſh colonies. The moſt beautiful are thoſe of Corinth. The other remarkable colonial coins are thoſe of Emerita, Ilice, Terraco, Caſſandria, Babba, Berytus, Cæſarea, Patræ, Emiſa, Heliopolis, or Balbec, Ptolemais, Sidon, Tyre, Deulton, Dium, Troas, Rheſaina, Neapolis of Samaria, which bears a repreſentation of Mount Gerizzim with the temple on it, Hippo in Africa, &c. On many of theſe coins we meet with fine repreſentations of temples, triumphal arches, gods, goddeſſes, and illuſtrious perſons. But coins with theſe repreſentations are by no means common; the colonial coins till the time of Trajan bearing only a plough, or ſome other ſimple badge of a colony. Camelodunum is the only colony in Britain of which we have any coins.

5. The *minimi.*—This includes the ſmalleſt coins of all denominations moſt of which do not exceed the ſize of a ſilver penny. They are the moſt curious of all: but no ſeries of them was ever formed by any perſon except the abbe Rothelin, whoſe collection formed of all metals paſſed to the queen of Spain. The reaſon of the ſcarcity of theſe ſmall coins is probably their diminutive ſize; by reaſon of which they are moſtly loſt.

It is ſurpriſing that numbers of Roman coins are found through all countries once ſubject to that powerful people. Some have been met with in the Orkneys,

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neys, and many in the moſt remote parts of Europe, Aſia, and Africa, known to the ancients.

TABLE III. *Coins of other ancient Nations.*

1. The Lydians appear to have invented coinage; though, perhaps, this honour may be diſputed with them by the Greeks.

2. The Aſſyrians, Medes, Babylonians, Phenicians, and Egyptians, had no coins. In the mouths of the mummies are only thin, unſtamped, and round pieces of gold to pay Charon's fare.

3. No Indian or Chineſe coins are to be met with till a very late period; and even then ſo rude as ſcarce to be worth notice. Voltaire mentions a collection of ancient Chineſe and Indian coins made by the emperor of China in 1700; but Mr Pinkerton ſuppoſes it to have conſiſted only of the Greek and Roman money which had been introduced into theſe countries.

4. The Lydian coins have no legends; ſo that mere conjecture only determines the ancient coins of electrum and ſilver found in Aſia, and different from the Perſian, to belong to Lydia. Crœſus coined gold into a form which he called *ſtaters*; and Mr Pinkerton mentions a very ancient gold coin in Dr Hunter's cabinet, which he ſuppoſes to have been one of theſe. It has a globous figure, with indented marks on one ſide, and on the other a man kneeling, with a fiſh held out in the left hand, and a ſword depending in the right. It weighs four drams; which Joſephus tells us was the weight of the Lydian gold coins. In the ſame collection are other gold coins little inferior in antiquity; the moſt ancient of which, our author ſuppoſes, may have been coined by the cities of Aſia Minor, as coinage paſſed through them to Greece. They are of admirable workmanſhip, and as much ſuperior to the beſt Sicilian coins, as the latter are to all the reſt in the world. Theſe gold coins are all extremely pale; owing to the want of knowledge in refining gold.

5. Perſian coins.—Theſe were firſt ſtruck by Darius Hyſtaſpes, whence they had the name of *Darics*. They are of gold, and generally have the figure of an archer: they weigh about four drachms; and ſome occur with the indented mark on one ſide, while others have figures upon both. The ſilver coins have generally a king in a chariot of two horſes, with a charioteer, and ſometimes another figure on foot behind on the obverſe; while the reverſe preſents a ſhip, ſometimes a ram, bull, or other animal. The gold coins, which only had the title of *Darics*, are extremely ſcarce, having been melted down, as is ſuppoſed, and recoined by Alexander the Great on his conqueſt of Aſia.

There is a ſecond ſeries of Perſian coins beginning with Artaxares, or Artaxerxes, who overthrew the Parthian monarchy about the year 210. Theſe are large and thin, with the king's buſt on one ſide and the altar of Mithras on the other; generally with a human figure on each ſide. Theſe coins continue till the year 636, when Perſia was conquered by the Saracens. Theſe have only Perſian letters upon them, which have never been explained by any antiquaries. Mr Pinkerton ſays that they ſeem to partake of the ancient Greek, Gothic, and Alanic.

6. The Hebrew ſhekels, originally didrachms, but after the time of the Maccabees tetradrachms, are almoſt all forgeries of modern Jews, as well as the braſs coins with Samaritan characters upon them. They have all a ſprig upon one ſide and a vaſe on the other. Mr Pinkerton ſays, that the admiſſion of one of them into a cabinet would almoſt be a diſgrace to it.

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7. Phenician and Punic coins are very intereſting on account of the great power and wealth of theſe nations. The alphabets have been cleared by their relation to the Hebrew and Syriac languages.

8. The coins of Palmyra come under the ſame denomination with the former, Palmyra being a Syrian city.

9. The Etruſcan coins have the characters of that nation, which have been explained by their affinity to the Pelaſgic, or oldeſt Greek and Latin.

10. The Spaniſh coins are inſcribed with two or three alphabets allied to the old Greek or Punic; but the inſcriptions have not been ſufficiently explained.

11. Gauliſh coins.—Theſe are numerous; but the moſt ancient have no legends; and even after the Greek letters were introduced into Gaul by a colony at Marſeilles, the legends are very difficult to be explained.

12. Britiſh coins. From a paſſage in Cæſar's commentaries, it has been inferred that the Britons uſed ſome kind of coins even in his time. Mr Pinkerton informs us, that ſome rude coins of copper very much mingled with tin are frequently found in England; which, he ſuppoſes, may be ſome of the ancient Britiſh money. They are of the ſize of a didrachm, the common form of the nummus aureus among the ancients. After the time of Cæſar, coinage increaſed among the Britons; and there are many found of Cunobelinus mentioned in the Roman hiſtory. Moſt of theſe have on one ſide CUNO, with an ear of wheat, a horſe, a kind of head of Janus, or other ſymbol; and have frequently alſo the letters CAMU; ſuppoſed to mean Camelodunum. Sometimes the word TASCIA occurs; the meaning of which has not yet been explained.

13. Gothic coins of France, Italy, and Spain, to the time of Charles the Great. Theſe have the Roman characters upon them. The Italian coins are moſtly of the ſize of ſmall braſs; and in this way we meet with coins of Athalaric, Theodohat, Witigez and other Gothic princes. Many others occur, the inſcriptions of which, though meant for Roman, are ſo perverted as to be illegible.

TABLE IV. *Modern Coins.*

1. Of Japan.—Theſe are thin plates of gold and ſilver, of an oval figure, with ſmall marks or figures ſtamped on them.

2. China.—Theſe are only copper, about the ſize of a farthing, with a ſquare hole in the middle to put them on ſtrings. The inſcriptions on them do not expreſs the name of the ſovereign, but the year of his reign; as the *happy year*, the *illuſtrious year*, &c.

3. The tartarian coins are rude, having only inſcriptions upon them; and they are all poſterior to the time of Jenghiz khan.

4. Coins of Thibet, Pegu, and Siam, are much the

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ſome, preſenting only inſcriptions without any figures. They are alſo of late date.

5. India.—Some old coins have been found in the neighbourhood of Calcutta, of gold, ſilver, copper, and tin, all mixed together. Theſe have commonly a warrior with a ſword on one ſide and an Indian female idol on the other, of the ſame form with the celebrated ſculptures in the iſland of Elephanta; but it is impoſſible to tell what antiquity they are of. The modern coins are the pagoda of gold, worth little more than ſix ſhillings; the roupee of ſilver upwards of two ſhillings; and the caſh, of copper. There is a remarkable ſet of roupees, which ſhow the twelve ſigns; a lion on one, a bull on another, &c. but the occaſion on which they were ſtruck is unknown. The other coins of India have generally Perſian inſcriptions upon them.

6. Perſia.—The Perſic coins ſince its conqueſt by the Arabs continue on the Arabian model.

7. Arabia.—Some coins of the petty princes of Arabia are met with as old as the imperial ages of Rome; but till the time of Haroun Alraſhid, no regular coinage appears in the vaſt empire of the Saracens. Even then the reverſe has only an inſcription, and the obverſe is copied from any Greek or Syrian coin which happened to fall in the moneyer's way. The later Arabian coins are moſtly ſilver, with the name and titles of the prince on one ſide, and ſome inſcription from the Koran on the other. The more modern coins of this country are in the ſhape of a fiſh-hook, with Arabic inſcriptions.

8. Turkey.—No regular coinage was formed by the Turks till they became maſters of Conſtantinople. They reſemble thoſe of Perſia and Arabia, having merely inſcriptions on both ſides.

9. The coins of the African ſtates, at leaſt ſuch as profeſs the Mohammedan religion, have merely inſcriptions without any figures: thoſe of the internal parts are unknown; and no coinage was uſed among the Mexicans and Peruvians, the only civilized nations in America; but La Hontan mentions an American ſavage who had a ſquare medal of copper depending from his neck. Mr Pinkerton ſuppoſes it to have come from Japan.

10. Modern Italic coins. Beſides the Gothic princes mentioned in the former table, the exarchs of Ravenna coined money with the inſcription FELIX RAVENNA, &c. The Lombards iſſued no coins, but there are ſome ſtill extant of Charlemagne. The following liſt ſhows the origin of the coinage in various Italian ſtates.

Rome. Papal coinage originates with Hadrian I. Size of ſilver pennies, with the Pope's name on one ſide, and SCOS PETRUS on the other. No coins appear from 975 to 1099, excepting of Leo IX. In 1303 appear pennies of the ſenate and people of Rome, with Peter on the one ſide and Paul on the other. There are groats of Clement V. with his portrait three quarters length; but the ſide-head begins with Sixtus V. in 1470. Gold was firſt coined by John XXII. in 1316. The coins of Alexander VI. Julius II. and Leo X. are remarkable for beauty and elegance.

Milan. Coinage began with Charlemagne. The firſt coin of the family of Viſconti occurs in 1330 under Azo. The ſet finiſhes with Louis XII.

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Naples. Coinage begins in 840 and 880, with Duke Sergius and Biſhop Athanaſius. The next coins are of Roger of Sicily, and Roger II. in 1130, William I. II. and Tancred. Naples and Sicily were ſubdued in 1194 by the emperor of Germany: in 1255 Manfred appears; in 1266 Charles of Provence; and others till Joan in 1414: after which follow the houſe of Arragon, and later kings.

Venice begins in the 10th century. The firſt coins are ſilver pennies marked VENECI. Then follow the coins of Henrico Dandulo in 1192, of Ziani in 1205, &c. Gold was firſt coined at Venice in 1280, and copper in 1471; but the ſilver groats are as old as 1192.

Florence. Silver was coined here in the 12th century, or before; but in 1252 the firſt gold coins ſtruck in Europe after the 8th century made their appearance, and were named *florins* from the flower of the lily upon them. They were imitated by the popes, by France, and England. They have on one ſide St John the Baptiſt ſtanding, on the other a large *fleur de lis*, and it is not doubted that the French *fleurs de lis* took their origin from theſe coins. They weigh a drachm, and are no leſs than 24 carats fine according to Italian writers, and are worth about 12 ſhillings Sterling.

Geneva firſt began to coin money in 1129, under the government of Conrad. Thoſe of the dukes of Savoy began in the ſame century.

Aquileia. Coins were iſſued from this city by the patriarchs from 1204 to 1440.

Ferrara. Coins of the marquiſes from 1340.

11. French coins. During the race of Clovis, from 490 till 751, the coins are chiefly gold *trientes*, with ſome *ſolidi* and *ſemiſſes*. The former are of good workmanſhip, with the heads of kings. The reverſe has a croſs, with the name of the town where they were ſtruck.

The coins of the ſecond race begin with Pepin in 751, and continue till Hugh Capet in 987. The coins of the firſt race are elegant, but thoſe of the ſecond entirely the reverſe, being almoſt all ſilver pennies, and ſeldom bearing the portrait of the king. Thoſe of Charlemagne have only CAROLUS in the field; while the reverſe bears R. F. or ſome ſuch inſcription; though one piece ſtruck at Rome has a rude buſt of him. The coins of Louis le Debonnaire are better done.

The third race begins with Hugh Capet in 987, and extends to this time. The coinage did not begin to improve till 1226 under St Louis, when the groat appears. Its name in Italian is *groſſo*, in French *groſſe*, in Engliſh *groat*, or great coin; ſo called from its ſize in compariſon with the penny; and it paſſed from Italy to France, to Germany, and to England. After the conqueſt of France by the Engliſh, baſe coins of many kinds were introduced; and in the year 1574, in the time of Henry III. copper was firſt introduced into the French coinage. Beſides theſe, the other remarkable coins of France are, the blancs or billon groats, firſt iſſued in 1348; the *ecus a la couronne*, or crowns of gold, ſo called from the crown on one ſide, and begun by Charles VI. in 1384: thoſe of Ann of Bretagne in 1498: the *teſton*, or piece with the king's head, of Louis XII.; the *Henri* of Henry II. with Gaul ſitting in armour, and a Victory in her hand. There are many coins of cardinal Bourbon, elected king in 1589; and in 1642, Louis XIV. takes the title of CATALONIÆ PRINCEPS. The firſt *Louis d'Or* made its appearance in 1640; but ſuch was the poverty of France, if we believe certain authors, that in 1719 the duke of Orleans regent ſtruck copper for ſilver.

12. Spaniſh coins. The moſt early ſeries of theſe conſiſts almoſt entirely of trientes, finely done. On one ſide they have the head of the king with his name, and on the other a croſs, with the name of the town, commonly in Bœtica, or the ſouth part of Spain, where there were a great many Roman colonies, and which was fertile to a proverb. The Moreſque coins of Spain, like thoſe of the reſt of the Mohammedan ſtates, preſent us only with inſipid inſcriptions on both ſides. Indeed the Mohammedan religion, by its abſolute refuſal to allow the repreſentation of any living creature, has prevented the progreſs of coinage in any degree throughout thoſe regions which it has overſpread. The inſcriptions on the ancient Spaniſh coins are in the Cufic or old Arabic characters.

13. Portugal. No deſcription of the coins of this kingdom has yet appeared.

14. Germany. No account of the German coins has been publiſhed; though it is well known that not only the emperors, but many of the cities, particularly thoſe called *Hanſe-towns*, iſſued money; and many of the coins iſſued by the cities were ſuperior in elegance even to thoſe iſſued by the emperors.

15. Denmark. Here the coinage begins with Canute the Great in 1014. The pieces are at firſt extremely rude, ornamented only with rings and runic characters. Theſe are ſucceeded by copper pieces, ſome of which have a croſs, others a paſtoral ſtaff on one ſide, with the letter A on the other. Later coins have ſtrokes IIII, &c. all round them; but thoſe of Harold, Hardicanute, and Magnus Bonus, in 1041, are of neat workmanſhip, and have the portraits of the princes at half length. The coins of Nicolas or Niel, as he is called by the Danes, are rude, as well as thoſe of Waldemar I. and the celebrated Margaret. In 1376 Olaf cauſed money to be ſtruck with a grinning full face, with a crowned O upon the other ſide. "The Swedes (ſays Mr Pinkerton) took theſe coins extremely ill, as they thought they grinned at them." Silver was firſt coined in Denmark by Philippa queen of Eric, and daughter to Henry IV. of England.

16. Sweden. The coinage of this kingdom began in 818 under Biorno, on the plan of Charlemagne. The coins are marked with a croſs. Next follow thoſe of Olaf in 1019; which Mr Pinkerton ſuppoſes to have been the firſt true Swediſh coins; and that the art of coinage firſt paſſed from England into Denmark in the time of Canute the Great, and from Denmark into Sweden. Theſe coins were ſtruck on the Engliſh model. During the time that Sweden was ſubject to Denmark, or miſerably haraſſed by the Danes, the coins of both kingdoms were the ſame but after the time of Guſtavus Vaſa many elegant pieces appear. In 1634, dollars were coined with the portrait of Guſtavus Adolphus, who was killed two years before: On the reverſe they have the arms of Sweden, with the chemical marks of mercury and ſulphur. In 1716, 1717, and 1718, Charles XII. being in extreme want of money, iſſued ſmall copper coins with Saturn, Jupiter, Mars, &c. upon them, to go for dollars; and on account of this ſcheme, Baron Goertz, the ſuggeſtor of it, was brought to the block.

17. Norway. The coins of this country begin with Olaf 1006; after which time there are various coins of other princes; but copper was not coined till the year 1343.

Beſides the coins already mentioned, there are eccleſiaſtical coins of France, Germany, Denmark, Sweden, Norway, &c. Thoſe of Denmark and Sweden are numerous, but the Norwegian coins of this denomination are rare. Mr Pinkerton deſcribes a ſilver one in his poſſeſſion as having arms and a mitre, with the inſcription on one ſide SANCTUS OLAWS REX NORVEY; on the reverſe OLAWS DEI GRA. ARCEP. NID'SEN, meaning NIDROSIENSIS, or archbiſhop of *Nidros*, now Drontheim.

18. Bohemia. The coinage of this kingdom appears at a very early date, viz. in the year 909, under duke Boleſlaus I. Theſe coins are followed by others of Boleſlaus II. and Emma his wife in 970; of Boleſlaus III. in 1002; Jaromir in 1020; Udalrich in 1030, and other princes. The *bracteate* money of Ottocar I. was coined in 1197.

19. Poland. The coinage of this country is nearly as ancient as that of Bohemia. The coins are on the German model, but no particular account of them has been publiſhed.

20. Ruſſia. None of the Ruſſian money appears to be more ancient than the 13th century. The firſt are the *kopecks* or ſilver pennies, which have upon them rude figures of animals upon one ſide, and a man ſtanding with a bow or ſpear on the other. There are likewiſe coins of Moſcow ſtruck by Ariſtoteles the architect in 1482. The *roubles* or dollars and their halfs. There are ſome of the impoſtor Demetrius in 1605, which are very ſcarce.

21. Pruſſia. The firſt Pruſſian coins were ſtruck at Culm by the Teutonic knights in 1230. They were ſilver pennies, and upon the German plan. In the next century were ſtruck ſhillings, groats, and *ſchots;* the laſt were the the largeſt, and are extremely rare. They have the Pruſſian ſhield, an eagle ſurmounting a croſs, with a roſe-ſhaped border, MONETA DOMINORUM PRUSSIÆ; on the reverſe is a croſs fleurie, within a border of a ſimilar kind, having the inſcription HONOR MAGISTRI, JUSTITIAM DILIGIT.—Gold coins were ſtruck in the ſame century. In the time of Copernicus the money was ſo debaſed, that 12 or 13 marks were worth but one of pure ſilver.

22. England. The Engliſh coins are of various kinds.

1ſt. *Heptarchic.* Theſe are only of two ſorts, viz. the *ſkeatta* or penny of ſilver, and the *ſtyca* of copper. Few of the pennies appear till after the year 700; though ſome are met with which bear the name of Ethelbert I. king of Kent, as old as 560. At firſt they had only rude figures of ſerpents but in latter times

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times legends were likewiſe added. Moſt of theſe princes have pagan ſymbols upon them. The ſtyca was only coined in Northumberland, and was a very ſmall piece about the value of half a farthing.

2d. Coins of the *chief monarchs* of England. Mr Pinkerton denies that an end was put to the heptarchy by Egbert in 832, as is commonly ſuppoſed; though he owns that he was *chief monarch* of the country, as ſeveral others had been before him. Edgar, who reigned in 959, according to him was the firſt king of England; and the coins of the chief monarchs form almoſt a complete ſeries from the time of Egbert to Edgar. The only chief monarch of whom there are no coins is Ethelbald, who reigned in 857. Moſt of theſe coins bear rude portraits; but the reverſes are ſometimes curious and intereſting. Some have views of cathedrals and other buildings; particularly one of Edward the Elder in 900; which has the cathedral of York with three rows of windows, round arched as the other Saxon and Norman buildings; the Gothic arch being quite unknown till after the 12th century. Some coins of Anlaf king of Northumberland have the famous raven, the Daniſh enſign; and thoſe of other princes have frequently very curious reverſes.

3d. *Eccleſiaſtic* coins appear of the archbiſhops of Canterbury, Wulfred, in 804, Ceolnoth in 830, and Plegmund in 189.

4th. Coins of the *kings* of England. The ſilver penny, which had begun during the heptarchy, continued to be the general coin after the kingdom had been united under one head; and extends in a continued ſeries from Egbert almoſt to the preſent reign. The only kings wanting are Edmund Ironſide, Richard I. and John. At firſt the penny weighed $22\frac{1}{2}$ grains; but towards the cloſe of the reign of Edward III. it fell to 18 grains; and in that of Edward IV. to 12. In the time of Edward VI. it was diminiſhed to eight grains; and in Queen Elizabeth's reign to $7\frac{23}{31}$; at which it ſtill continues.

Halfpennies and farthings were firſt ſtruck in ſilver by Edward I. in 1280; the former continued to the time of the commonwealth, but the latter ceaſed with Edward VI. The groat was introduced by Edward III. in 1354, and continues to this day, though not in common circulation. The half-groat or twopence is of the ſame date, and alſo continues to the preſent time.

Shillings were firſt coined by Henry VII. in 1503. At firſt it was called *teſtoon*, from the *teſte*, *tete*, or head of the king upon it; the name *ſhilling* being derived from the German *ſchelling*; under which appellation coins had been ſtruck at Hamburgh in 1407. The crown was firſt coined in its preſent form by Henry VIII. Formerly it had appeared only in gold, whence the phraſe of crowns of gold; though theſe indeed were the largeſt gold coins known for a long time in France and other countries on the continent, being worth about 10s. ſterling. They had their name from the crown ſtamped on one ſide, and were firſt coined by Charles VI. in 1384, and continued till the time of Louis XIV. The half-crown, ſixpence, and threepence, were coined by Edward VI. In 1558 Queen Elizabeth coined three halfpenny, and in 1561 three farthing, pieces; but they were diſcontinued in 1582. From the year 1601 to the preſent time the coins of England remain the ſame.

Gold was coined in England by Henry III. in 1257; the piece was called a *gold penny*, and was larger than the ſilver one; and the execution is by no means bad for the time. The ſeries of gold coinage, however, commences properly from Edward III. In 1344 this monarch firſt ſtruck florins, in imitation of thoſe in Italy; and it is remarkable, that though theſe coins at the time they were firſt iſſued bore only ſix ſhillings value, they are now intrinſically worth 19s.; ſo much has the value of gold increaſed ſince that time. The half and quarter florin were ſtruck at the ſame time, but only the laſt has been found. The florin, however, being found inconvenient, gave place to the noble of 6s. 8d. value, and exactly half a mark. The latter had its name from being a limited ſum in accounts; and was eight ounces in weight, two thirds of the money pound. It is ſometimes alſo called *ſelibra*, as being one half of the commercial pound of 16 ounces. The noble had its name from the nobility of the metal; the gold of which it was coined being of the fineſt ſort. Sometimes it is called *Roſe Noble*, from both ſides being impaled in an undulating circle. It continued with the half and quarter noble to be the only gold coin till the angels of Edward IV. appeared in 1465. Theſe had their name from being ſtamped with the image of Michael and the dragon. The angelites of 3s. 4d. value were ſubſtituted in their place. In 1527 Henry VIII. added to the gold coins the crown and half-crown at their preſent value; and the ſame year he gave *ſovereigns* of 22s. 6d. and *ryals* of 11s. 3d. angels at 7s. 6d. and nobles at their old value of 6s. 8d. In 1546 he cauſed ſovereigns to be coined of the value of 20s. and half ſovereigns in proportion. His gold coin is about the ſize of the ſhilling, and the half-crown of ſixpence, but thin. All his coins, however gold as well as ſilver, are much debaſed; and it was not without much labour and trouble that Edward VI. brought it back to its former ſtandard. On the union of the two crowns, James gave the ſovereign the name of *unite;* the value continuing of 20s. as before. He coined alſo roſe-ryals of 30s. value ſpurryals of 15s. angels of 10s. and angelets of 5s. Under the commonwealth, the ſovereign got the name of the *twenty-ſhilling* piece, and continued current till the coinage of guineas. Theſe were ſo called from their being coined of Guinea gold, and were at firſt only to go for 20s. though by an univerſal but tacit conſent they always paſſed for 21s. Half-guineas, double guineas, and five guinea pieces, were alſo coined during the ſame reign; which ſtill continue, though the two latter are not in common circulation. Quarter guineas were coined by George I. and likewiſe by his preſent majeſty; but they were found ſo troubleſome on account of their ſmall ſize, that they were ſtopped within a year or two when received at the bank of England; and thus are not to be met with at preſent. A few pieces of 7s. value have likewiſe been coined, and are known by the lion above the helmet; but none have been iſſued. In 1688 the guinea roſe to 21s. 6d. and continued to increaſe in value till 1696, when it was as high as 30s.; but after the recoinage in 1697 and 1698 it fell by degrees, and in 1717 was at its old ſtandard of 21s. and at that time ſilver was

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was fixed at its preſent ſtandard value, viz. as 1 to 15½ in weight.

Though the firſt money coined in Britain, as we have already obſerved, was copper, yet, excepting the Northumbrian ſtycas, no copper coin was found in England from the time of the Saxon conqueſt till the year 1672. An averſion to a copper coinage it ſeems was prevalent throughout the nation; and Queen Elizabeth, who without heſitation uſed baſe money for Ireland, yet ſcrupled at coining copper for England. This want of ſmall coin occaſioned ſuch an increaſe of private tokens for halfpennies and farthings, that it became a ſerious object to government; and in 1594 a copper coinage was ſeriouſly thought of. This year a ſmall copper coin was ſtruck about the ſize of a ſilver twopence, with the queen's monogram on one ſide, and a roſe on the other; the running legend on both ſides being THE PLEDGE OF A HALFPENNY. Of this there are patterns both in copper and ſilver, but both of them ſoon fell into diſuſe. On the 19th of May 1613, King James by royal proclamation iſſued farthing tokens. They are generally of the ſame ſize with the two pence, with two ſcepters in ſaltier ſurmounted with a crown, and the harp upon the other; with an intention, as it would ſeem, that if they were refuſed in England they might paſs in Ireland. In 1635 Charles I. coined thoſe with the roſe inſtead of the harp; but the circulation of theſe was entirely ſtopped by the vaſt number of counterfeits which appeared, and by the king's death in 1648. After this the private tokens began again to circulate, till put a ſtop to by the coinage of farthings in 1672. The workmanſhip of the tokens is quite contemptible. In 1672 the halfpence as well as the farthings which had been ſtruck two years before began to circulate. They were of pure Swediſh copper, the dyes engraved by Koettier; and they continued till the year 1684, when ſome diſputes aroſe about the copper lately obtained from the Engliſh mines. Tin farthings were coined with a ſtud of copper in the centre, and inſcribed round the edge as the crown pieces, with NUMMORUM FAMULUS, 1685 or 1686. In 1685 halfpence of the ſame kind were coined; and the tin coinage continued till the year 1692, to the value of more than L. 65,000; but next year the tin was all called in by government, and the copper coinage recommenced. The farthings of Queen Anne are all trial pieces excepting thoſe of 1714, the laſt year of her reign. "They are (ſays Mr Pinkerton) of exquiſite workmanſhip, exceeding moſt copper coins either ancient or modern, and will do honour to the engraver Mr Croker to the end of time. The one, whoſe reverſe is Peace in a car, PAX MISSA PER ORBEM, is the moſt eſteemed; and next to it the BRITANNIA under a portal. The other halfpence and farthings are leſs valuable.

23. Scotland. Silver pennies of Alexander I. who reigned in 1107, are believed to exiſt; and there certainly are ſome of Alexander II. in 1214. There are likewiſe coins of David in 1124: but perhaps none of Malcolm IV. his ſucceſſor, whoſe reign was very ſhort. There are many coins of William I. in 1165; and a large hoard of his pennies was found at Inverneſs in 1780.

The money of Scotland continued to be of the ſame value with that of England till the country was drained by the vaſt ranſom of David II. after which it became neceſſary to reduce its value; and ſo much did this diminution affect England, that Edward III. found himſelf obliged to leſſen the Engliſh coin alſo. The diminution of the Scottiſh coin, however, continued ſtill to go on until it became impracticable to keep par with that of England. In the firſt year of Robert III. it paſſed only for one half its nominal value in England; in 1393, Richard II. ordered it only to go for the weight of the genuine metal it contained. In 1600 it had ſunk to ſuch a degree as to paſs only for a twelfth part of the Engliſh money, and continued at that low ebb till the coinage of Scotland was entirely cancelled by the Union of the two kingdoms.

Of ſilver coins we have only pennies till the year 1293, when Edward I. having coined halfpence and farthings, Alexander III. of Scotland coined alſo halfpence, of which we have a few, but no farthings are to be met with; but there are ſilver farthings of Robert I. and David II. The latter introduced the groat and half-groat, which completed the ſet of Scottiſh ſilver. It continued unaltered till the time of Queen Mary, when they all ceaſed to be coined in ſilver, on account of the high price of that metal. In 1553 ſhillings were firſt coined with the buſt of the queen on one ſide and the arms of France and Scotland on the other. The ſilver crown was firſt coined in 1565, which went for 30 s. Scots; leſſer pieces of 20 s. and 10 s. having likewiſe been ſtruck, and marks of ſilver, worth 3 s. 4 d. Engliſh were alſo coined about the ſame time. Theſe coins have upon them the marks XXX. XX. X. to denote their value. They are commonly called Cruikſtone dollars, from the palm tree upon them, miſtaken for a remarkable yew at Cruikſtone near Glaſgow, where Henry Darnley reſided. It is deſcribed, however, in the act as a palm, with a "ſhell-padoc" (a tortoiſe) crawling up. This alludes to Darnley's marriage with the queen, as the motto from Propertius DAT GLORIA VIRES alſo implies. The motto NEMO ME IMPUNE LACESSET firſt appears on the Scottiſh coins in 1578, and the invention is given to the celebrated Buchanan. In 1582, the crown of an ounce weight went for 40 s. Scots, and was accordingly marked XL.; in 1597 the mark was L. the Scottiſh money being then only one-tenth of the Engliſh: the mark was LX in 1601, the value being then reduced to one twelfth, at which it has ever ſince continued. In the time of Charles I. half marks, 40 and 20 penny-pieces, were coined. In 1675 the Scottiſh dollars firſt appeared, in value 56 s. Scots, with halves and quarters of proportional value. In 1686, James VII. coined 60, 40, 20, 10, and 5 s. pieces; but only thoſe of 40 and 10 s. are known, with theſe numbers under the buſt. At the Union of the kingdoms, all the Scottiſh coins were called in, and recoined at Edinburgh, with the mark E under the buſt to diſtinguiſh it; ſince which there has been no coinage in Scotland. The Scottiſh ſilver coins are in general equal, if not ſuperior, in the workmanſhip to the Engliſh.

Gold was firſt iſſued by Robert II. about 30 years after Edward III. of England had coined the ſame metal in that country. The pieces were at firſt called St Andrew's from the figure of that tutelar Saint upon the croſs, and who appears on the obverſe with the arms of Scotland, and on the reverſe a lion in a ſhield. The lion was another name for the largeſt gold coin in Scotland, from the arms of the kingdom upon it. The next was the unicorn, under James III.; which were followed by the bonnet-pieces of James V. Theſe laſt are of admirable workmanſhip, being almoſt equal to the ancient coins in this reſpect. In imitation of the French, the monarch we ſpeak of diminiſhed the ſize of the coin without leſſening its weight, an improvement not adopted by the Engliſh for a whole century. The laſt gold coined in Scotland was the piſtole and half piſtole, of twelve and ſix pounds Scots. Theſe coins have the ſun under the head. The gold coins of Scotland fell in the ſame proportion with the ſilver

The copper coinage of Scotland is of more early date than that of England. It was preceeded by money of *billon*, or copper waſhed with ſilver, called black money. James III. firſt coined black farthings in 1466; and this is recorded by hiſtorians as one of his greateſt faults. This kind of coinage, however, continued as late as the reign of James VI. In his time the true copper coinage began; but as the value of Scottiſh money was now declined almoſt to the utmoſt, the pieces ſuddenly aſſumed a form almoſt reſembling that of the French coins. The *bodle*, ſo called from Bothwell the mintmaſter, being equal in ſize to the *liard*, and worth two pennies Scottiſh, was ſtruck. The billon coin, formerly called *bas-piece*, and worth ſix pennies Scots, was now coined in copper, and termed the *baw-bee*. Thus it correſponded with the French half ſol and Engliſh halfpenny, the Scots penny being now equivalent to the French *denier*. Some pieces named *Atkinſons* were coined by James VI. in 1582, when the Scottiſh money was to the Engliſh as 1 to 8; but on its being ſtill farther reduced they went for 8 pennies, a third more than the value of the baw-bee. Beſides theſe there were the hardie and plack, the former being worth three and the latter four pennies Scots. This coinage continued through the reigns of Charles I. and II. but Scottiſh coins of the former are, perhaps, the ſcarceſt of any.

24. Ireland. The firſt coins introduced into this kingdom ſeem to have been thoſe of the Danes, and which have only a number of ſtrokes around them inſtead of letters. In the tenth century, however, this coinage had been conſiderably improved; and in 930 and 994 there are pennies ſtruck in Dublin, with the inſcription on DVFLI or DYFLI, *Duflin* or *Dyflin*, being the Daniſh name of that city. There are likewiſe coins of the Iriſh princes themſelves, and of the Engliſh monarchs, ſtruck in Ireland as early as the ninth century; and it is aſſerted by ſome, that Ireland even in theſe days had been conquered by England; of which, indeed, theſe coins ſeem to be a proof. None of the Iriſh coins of Henry II. are to be met with, but we have ſome of the coins of John; and from his time to that of Henry V. the Iriſh coins are known by a triangle incloſing the king's head, which appears alſo upon the coins of other nations at this period. The harp does not appear upon the Iriſh coins till the time of Henry VIII. Till the time of this monarch, the Engliſh and Iriſh coins are the ſame; but the ſame debaſement of the coin which at that time took place in England extended alſo to Ireland; but in 1601 copper halfpence and farthings were coined alſo for this kingdom. Theſe circulated in Ireland when James VI. iſſued his farthing-tokens of copper, the latter being of two ſizes, that if they failed in England they might be ſent to Ireland as pennies and halfpence. In 1635 a mint was eſtabliſhed in Dublin by Charles I. but it was ſtopped by the Iriſh maſſacre, and the many diſturbances which followed; ſince which time the ſcheme has not been reſumed. After the maſſacre, St Patrick's halfpence and farthings were coined by the Papiſts, bearing the legends FLOREAT REX, and on the reverſe ECCE GREX; on the farthing QUIESCAT PLEBS. Copper-tokens were ſtruck by towns and tradeſmen, as in England and Scotland. In 1680, halfpence and farthings were iſſued by authority, with the harp and date. In 1689, James II. having invaded Ireland, inſtituted a mint, and coined ſhillings and half-crowns of all the refuſe metal he could find, particularly ſome braſs guns were employed, whence the coinage is commonly called *gun-money*. Even this metal, however, ſoon became ſo ſcarce, that a diminution in its ſize is quite apparent from June 1689 to July 1690; and as the month of their mintage is marked upon them, this decreaſe is eaſily perceived. In March 1690, pennies of lead mixed with tin were iſſued; and on the 15th of June the ſame year, crowns of white metal were coined; but theſe are now very ſcarce. In 1722, the patent for coining halfpence and farthings was given to William Wood, which excited ſuch diſcontent in Ireland. From the ſmall ſize allowed by the patent to theſe pieces, it was ſuppoſed that the patentee would have gained 60,000l. but as he cauſed them to be ſtruck of a ſize ſtill ſmaller, his gains were eſtimated at 100,000l. The coins, however, are of admirable workmanſhip, and very fine copper, bearing the beſt portrait of king George I. to be found any where. Sir Iſac Newton, at that time at the head of the mint, declared that they were ſuperior to the Engliſh coins in every thing except the ſize. In 1737 the Iriſh halfpence and farthings, with the harp on the reverſe, were coined, and continue to the preſent time. In 1760, there was ſuch a ſcarcity of copper coin, that ſome private perſons applied for leave to coin halfpence, which appeared with a very bad portrait of George II. and the words VOCE POPULI around it. No gold or ſilver has been coined in Ireland ſince the maſſacre of 1641.

TABLE V. *Modern Medals, properly ſo called.*

1. Scottiſh medals. Theſe take the lead in the preſent article, the firſt modern medals of gold being thoſe of David II. ſtruck between the years 1330 and 1370. Only two of them now exiſt; one in the collection of Mr Barker of Birmingham, and the other in that of Dr Hunter. In 1478, there is a medal of James III. ſent to the ſhrine of St Amboiſe in France. It is deſcribed as of two inches and a third in diameter: the weight near two ounces; having on the obverſe a beardleſs king, with long hair, ſitting on a throne, holding in one hand a naked ſword; in the other a ſhield, with the Scottiſh arms. On the borders of the canopy above the throne is an inſcription in Gothic letters, IN MI DEFFEN, being corrupt

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French for *In my defence;* a common motto in the Scottiſh arms. Above the canopy is Villa Berwici: the reverſe bears St Andrew and his croſs, salvum fac populum tuum domine. There is alſo a medal of James IV. in the collar of St Michael, having on the reverſe a Doric pillar ſurmounted by a young Janus, ſtanding on a hill, beyond which is the ſea, and land on either ſide. This, however, is by ſome ſuſpected to be a forgery.

The moſt remarkable Scottiſh medals are thoſe of the unfortunate Mary. The firſt is properly French, having been iſſued at her coronation as queen of France, along with her huſband king Frances II. On the obverſe of this piece there are portraits of Francis and Mary, face to face, with three legends around them, the outermoſt containing their titles; the middle one the following ſentence: hora nona dominus j. h. s. expiravit helli clamans; the innermoſt the name of the city (Paris). On the reverſe are the arms of France and Scotland. Fine teſtoons were alſo coined upon the ſame plan, and are now ſo rare that Dr Hunter gave ten guineas for one he has in his collection. The ſame portraits appear on the fine crown of Mary and Henry, in 1565, which is ſo rare as to be eſteemed a medal of the higheſt value; and Mr Pinkerton imagines, that if brought to a ſale it would bring 40 or 50 guineas.

Another remarkable medal of Mary repreſents her full faced, and weeping, with the inſcription, O God grant patience in that i suffer vrang. The reverſe has in the centre, Quho can compare with me in grief, I die and dar nocht seek relief; with this legend around, Hourt not the (figure of a heart) quhais joy thou art. There are alſo many counters of this unfortunate princeſs, being thin ſilver-pieces of the ſize of a ſhilling. "They all appear (ſays Mr Pinkerton) to have been done in France by Mary's direction, who was fond of devices. Her cruel captivity could not debar her from intercourſe with her friends in France, who muſt with pleaſure have executed her orders, as affording her a little conſolation."

The coronation medal of Charles I. ſtruck at Edinburgh for his inauguration, June 18. 1663, is remarkable as being the only one ever coined of Scottiſh gold, and the firſt in Britain ſtruck with a legend on the edge. With reſpect to the workmanſhip, it is inferior to Simon's. Of theſe medals only three are known to exiſt, of which one is in the Muſeum. It is not uncommon in ſilver; in which caſe it ſometimes wants the legend on the edge.

2. Italian medals. Theſe appear in the 15th century, and from that time ſucceſſively in moſt European countries. Vittore Piſano, a painter of Verona, is celebrated as the reſtorer of the art, but it remains to be accounted for how the medals of king David already mentioned came to exiſt ſo long before. Mr Pinkerton conſiders this artiſt rather as an inventor than a reſtorer, his medals having no reſemblance to the ancient coins, as being large, and all caſt. They were firſt modelled in wax, then a mould taken from the model in fine ſand, and other ingredients. After a good caſt was procured, it was touched up, and made a model for the reſt. Theſe medals of Piſano are almoſt always inſcribed *Opus Piſani Pictoris.* The portraits of a great number of illuſtrious men were done by him in this manner; and in the Britiſh Muſeum is a large braſs medal of Piſano by himſelf.—Other artiſts were Baldu, Moreſcotto, Matthæus de Paſtus, Sperandes, Miſaldone, &c. Towards the end of the century, however, the medals began to aſſume a more elegant appearance; and the Papal ones are not only the moſt elegant but the moſt ancient ſeries of all the modern medals. The improvement began in the reign of Alexander VI. ſo famous for his own crimes, and thoſe of his nephew Cæſar Borgia. His ſucceſſors, Julius II. Leo X. Hadrian VI. and Clement VII. had many of their medals deſigned by Raphael, Julio Romano, and other eminent painters, and the engraving executed by artiſts of equal merit. Among theſe were the celebrated Cellini, and the noted Paduan forgers of Roman coins, Cavino and Baſſiano. In 1644 Cormanni, a medallic artiſt, was impriſoned on account of a piece which repreſented the Pope upon one ſide, and Olympia Maidalchina, the *relation* of his holineſs, on the other. The unfortunate Cormanni poiſoned himſelf. About this time the family of the Hamerani, originally from Germany, began to engrave the papal medals; which they did with ſurpriſing merit for ſeveral generations. Each of the daughters did a fine medal, as we are informed by Venuti.

Beſides the papal medals, there are many iſſued by the various ſtates of Italy. There are medals of Frederic II. of Sicily in 1501, of ſeveral Venetian generals in 1509, of Alfonſo duke of Ferrara in 1511, and of the celebrated Andrew Doria in 1528.

3. French medals. Till the reign of Louis XIV. the medals of this country are neither fine nor numerous; but this monarch exceeds all modern princes in this way. Many of his pieces are well deſigned and executed, though objectionable on account of their falſehood.

4. Daniſh medals. Theſe appear of Chriſtian II. in 1516, of Frederic and Sophia in 1532, of Frederic I. and Chriſtian III. in bonnets worn in the 16th century. The elephant of the houſe of Oldenburg is frequent upon Daniſh medals.

5. Swediſh medals. Theſe begin with Guſtavus Vaſa; and ſeveral of Chriſtiana are likewiſe to be met with. There are alſo ſome curious ones of Charles XII.

6. Dutch Medals. Theſe begin in 1566; and many of them are remarkable for maps and plans, which muſt be very intereſting to poſterity. "Had the Greeks and Romans (ſays Mr Pinkerton) given us maps and plans, what a fine ſyſtem of ancient geography and topography a cabinet of medals muſt have been!"

7. Medals of Spain, Portugal, and Germany. The Spaniſh medals began with Gonſalo in 1503, many of which are curious and intereſting. Under Cha. V. there are many curious Spaniſh medals; but thoſe of Germany begin with Frederic in 1453. They are extremely numerous; as we may eaſily ſuppoſe from the greatneſs of the empire, and the various ſtates which compoſe it. There is a famous medal of Sebaſtian king of Portugal, famous for his unfortunate expedition into Africa in 1578; with his buſt, full face, and three quarters in length. On the reverſe is a ſhell-fiſh in the ſea, with the moon and ſeven ſtars, bearing the inſcription Serena Calsa favent. There is alſo a curious lozenge-ſhaped coin of the ſame with the arms of Portugal, and the king's name and title; On the

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reverſe is a croſs with the inſcription IN HOC SIGNO VINCES, 1578.

8. Satyric medals. Theſe began almoſt as ſoon as the knowledge of the art of coining medals was revived. They ſeem to have been almoſt unknown to the ancients. One indeed of the Emperor Gallienus is ſuppoſed to have been ſatyric. It has on the front the emperor's buſt, with the inſcription GALLIENÆ AUG. the reverſe is Peace in a car, PAX UBIQUE; but this has been proved to be only a blundered coin. Some other ancient medals, however, are not liable to this objection. The firſt modern ſatyric medal publiſhed was that of Frederic king of Sicily in 1501 againſt his antagoniſt Ferdinand king of Spain. It has on one ſide the head of Ferdinand, with the inſcription FERDINANDUS R. AR. VETUS VULPES ORBIS; on the reverſe a wolf carrying off a ſheep, JVGVM MÆVM SVAVE EST ET ONVS MEVM LEVE. Many others have been ſtruck, of which the wit would now perhaps be difficult to be found out; but of all nations the Dutch have moſt diſtinguiſhed themſelves in this way, and paid very dear for their conduct, as they brought upon themſelves by one or two ſatyric medals the whole power of France under Louis XIV.

9. Engliſh medals. The firſt of theſe is in the duke of Devonſhire's collection. It is of a large ſize, and done on the plan of the early Italian medals. It has on the reverſe the arms of Kendal, with the inſcription TEMPORE OBSIDIONIS TURCORUM, MCCCCLXXX. On the other ſide is a portrait with IO. KENDAL RHODI TVRCVPELLERIVS. It was found laſt century in Knareſborough foreſt; but Mr Pinkerton has no doubt of its having been done in Italy. The next is that of Henry VIII. in 1545, and is of gold, larger than the crown-piece, with the king's head upon the obverſe, and three legends within each other, including his titles, &c. The reverſe contains two inſcriptions, declaring him to be the head of the church; the one in Hebrew, the other in Greek. It was imitated exactly by Edward VI. whoſe coronation-medal is the firſt we have. There are two medals of Philip and Mary, whoſe execution is tolerably good; but thoſe of Elizabeth are very poor. There are good medals of James I. and his queen; with a fine one of Charles I. and Henrietta, though the workmanſhip is much inferior to the antique. There are many good medals of Charles, with various devices upon their reverſes. Under the commonwealth the celebrated Simon produced medals which are deſervedly reckoned the moſt admirable pieces of modern workmanſhip. There are many good medals of Charles II. James II. and William III. Some are alſo found of James after his abdication. Some fine gold, ſilver, and copper medals, were iſſued in the time of Queen Anne; the two laſt affording a ſeries of all the great actions of the duke of Marlborough. About the year 1740, a ſeries of medals was engraved in London by Daſſier, a native of Geneva, containing all the kings of of England; being 36 in number. They are done upon fine copper, and executed with great taſte. There are beſides many medals of private perſons in England; ſo that it may juſtly be ſaid, that this country for medals exceeds almoſt every other in Europe.

Abbreviations.

To this account of modern coins and medals we ſhall add that of another ſet called *ſiege pieces*, and which were iſſued during the time of a ſiege in caſes of urgent neceſſity. Theſe were formed of any kind of metal; ſometimes of no metal; and Patin mentions a remarkable one ſtruck at Leyden in 1574, when the place was beſieged by the Spaniards. It was of thick paper or paſteboard, having a lion rampant, with this inſcription, PVGNO PRO PATRIA, 1574; and on the reverſe, LVGDVNVM BATAVORVM. There are various ſiege-pieces of Charles I. both in gold and ſilver, ſome of the latter being of the value of 20 ſhillings.

The *nummi bracteati* are a ſpecies of modern coins ſomewhat between counters and money; and have their name from the word BRACTEA, a ſpangle or thin bit of metal. They are commonly little thin plates of ſilver, ſtamped as would ſeem with wooden dies upon one ſide only, with the rude impreſſion of various figures and inſcriptions. Moſt of them are eccleſiaſtic, and were ſtruck in Germany, Switzerland, Denmark, Sweden, Norway, and a few in Poland. They continued to be in uſe in Germany till the end of the 15th century; and ſome are ſtill uſed in Switzerland at this day.

Table of Abbreviations uſed in the Legends of Medals; from Mr Pinkerton.

Greek Coins.

A

Α. Athens, Argos, Aulus, Aſylum; primi or firſt; as Εφεσιων Α. Ασιας, "Epheſians firſt people of Aſia"
Α. Abbaſſus, Abdera, Abydus on Helleſpont
ΑΒ. Abydus in Egypt
ΑΒΥ. Abydus on Helleſpont
ΑΘ. ΑΘΕ. Athens
ΑΙΓ. Aegina
ΑΙΓΟΣΠΟ. Aigoſpotamos
ΑΙΛ. Aelius, Aelia Capitolina
ΑΙΝ. Aenos
ΑΚ.-ΑΚΡΑΤΑΝ. Agrigentum
ΑΚΙ. Acilium
ΑΚΤ. Actium
ΑΛΕ. Alexandria
ΑΜ. Amyntas
ΑΜΒΡ. Ambracia
ΑΜΦΙ. Amphilochia
ΑΝΘ. Ανθυπατον, Proconſul
ΑΝΤΙΣ. Antiſſa
ΑΝΑ. Anactoria
ΑΝΤΙ. Antium
ΑΝ. Ancyra
ΑΝΤ. Antoninus, Antioch
ΑΣ. Axus in Crete
ΑΟΝ. Aonitæ
ΑΟΥΕ. Avenio, *Pell.*
ΑΠ. Appius
ΑΠΑ. Apamea
ΑΠΟ. Apollonia
ΑΠΤΑ. Aptara
ΑΡ. Aradus, Harma
ΑΡΓΕ. Argennos
ΑΡΓ. Argos
ΑΡΙ. Aricanda
ΑΡΙΜ. Ariminum
ΑΡΣΙ. Arſinoe
ΑΡΥ. Aryca
ΑΡΧ. Αρχιερευς or Αρχον, high prieſt or magiſtrate
ΑΣΙΑΡΧ. Arſiarchæ, preſidents of the games of Aſia (B)
ΑΣ. Aſylum
Α. Σ. Προτοι Συριας, Firſt of Syria
ΑΣΚ. Aſcalon
ΑΤ. Atabyrium
ΑΤΑΡ. Atarnæ
ΑΥΓ. Auguſtus
ΑΥΡΗΛ. Aurelius
ΑΥ. ΑΥΓ. Αυτοκρατορ Emperor
ΑΥΤΟΝ. Αυτονομοι, enjoying their own laws
ΑΦΙ. Aphyta
ΑΦΡ. Africanus
ΑΧ. Achaii

B

Β. Βουλης, Council: Berytus: Bithynia
ΒΑΓΗΔΑΟ. Bagadonia
ΒΑΛ. Valerius

ΒΗ.

(B) There were alſo Syriarchæ, Lyciarchæ, Galatarchæ Bithyniarchæ, Cappadociarchæ, &c. *Morel. Spec.*

ΒΗ. Berytus
ΒΙΤΟΝ. Bitontum
ΒΟΙ. Bœtia
ΒΡΥΝ. Brunduſium
ΒΥ. Byzantium
Γ
Γ. ΓΡ. ΓΡΑΜ. Grammaticus, or keeper of the records
Γ. Gaius, or Caius
ΓΑ. Gallus, Gallerius, Gallienus
Γ. Γνωριμου, Illuſtrious.
ΓΕΛ. Gelas
ΓΕΡ. Germanicus
ΓΝ. Gneius
ΓΟΡΤΥ. Gortyna
ΓΡΑ. Graviſca
Δ
Δ. Decimus, Dymæ
ΔΑΚ. Dacicus
ΔΑΜ. Damaſcus
ΔΑΡ. Dardanum
ΔΗ. Δημος, the people
ΔΗΜΑΡΧ. ΕΞΟΥΣ. with Tribunitian power
ΔΕ. Decelia
ΔΕΚ. Decius
ΔΕΡ. Derbe in Lycaonia
ΔΗ. Delos
ΔΙ. Dioſpolis
ΔΡΕ. Drepanum
ΔΥΡ. Dyrrhachium
Ε
Ε. Eryce
Ε. ΕΡΕΣ. Ereſus
ΕΛΕΥ. Eleuſis
ΕΛΕΥΘ. Ελευθεροι, Free
ΕΠΙ. Epidaurus
ΕΡΙ. Eriza in Caria
ΕΡΧ. Erchia
ΕΡΥ. Erythræ
ΕΤ. ΕΤΟ. Ετους, Year
ΕΤ. Etenna in Pamphylia
ΕΧ. Εχουσια, Power
ΕΥ. ΕΥΒΟ. Eubœa
ΕΥΣ. Ευσεϐης, Pious
ΕΥΤ. Ευτυχης, Happy
ΕΦ. ΕΦΕ. Epheſus
Ζ
ΖΑ. Zacynthus
ΖΑΝΚΛ. Zancle, Meſſana anciently ſo called
Η
Η. Elium
ΗΓ. Ηγεμονος, Preſident
ΗΡΑΚ. Heraclea
Θ
ΘΑ. Thaſius
ΘΕ. Theſpiæ
ΘΕΣ. Theſſalonica
ΘΕ. ΘΗΒ. Thebæ.
Ι
Ι. ΙΕΡ. Ιερας, Sacred
ΙΕΡΑΠΥ. Hyerapytha
ΙΚΑΡ. Hiccara
ΙΛΙ. Ilium
ΙΟΥ. Julis a city, or Julius
ΙΟΥΛ. Julia
ΙΠΑ. Hippana
ΙΡ. Irene Inſ. *Pellerin.*
ΙΣ. Iſus, Iſtiæa
Κ
Κ. Caius; Κουιντος, Quintus
Κ. ΚΑΙΣ. Cæſar
Κ. Κ. Κοινον, Κιλικιας, Community of Cilicia
ΚΑΙΛ. Cælius
ΚΑΛ. Chalcedon
ΚΑΛΛΙ. Callipolis
ΚΑΜΑ. Camara
ΚΑΝ. Canata
ΚΑΠ. Capua
ΚΑΠΠ. Cappadocia
ΚΑΡ. Carrhæ
ΚΑΡΤ. Carthago
ΚΑΥ. Caulonia
ΚΕ. Ceos
ΚΕΦ. Cephalædis
ΚΙ. Cianus, Cibæum
ΚΙΛ. Cilbiani
ΚΛ. Clæonæ, Cladius
ΚΛΑ. Clazomene
ΚΝΙ. Cnidus
ΚΟ. Corinth
ΚΟΙΝ. Κοινον, Community
ΚΟΛ. Κολονιας, Colony, Colophon
ΚΟΜ. Commodus
ΚΟΡ. Corcyra
ΚΡ. Cragus in Lycia
ΚΡΑ. Cranos
ΚΡΗ. Crete
ΚΤΗ. Ctemenæ, *Pell.*
ΚΥ. Cuma, Cydonium, Cyon
ΚΥΘ. Cythnus
ΚΥΠ. Cyprus
ΚΥΡ. Cyrene
Λ
Λ. or L. Λυκαϐαντος, Year
Λ. Lucius
ΛΑ. Lacedæmon
ΛΑΜ. Lamea; Lampſacus
ΛΑΡ. Lariſſa
ΛΑΡΙ. Larinum
ΛΕ ΛΕΥ. Leucas
ΛΕΟΝ. Leontium
ΛΗΜ. Lemnos
ΛΙΠ. Lipara
ΛΙΥΙ. Liviopolis
ΛΟ. ΛΩΚ. Locri.
ΛΟΓ. Longone
ΛΥΤ. ΛΥΚ. Lyctus
Μ
Μ. Marcus, Malea, Megalopolis, Mazaka
ΜΑ. Maronea, Maſſilia, Macedonia
ΜΑΓ. Magneſia
ΜΑΚΡΟ. Macrocephali
ΜΑΜ. Mamertini
ΜΑΣΣ. Maſſilia
ΜΑΖ. Mazara
ΜΕ. Menelais, on Syrian regal coins
ΜΕΝΕΚ. Menecrates
ΜΕ. ΜΕΓ. Megara, Megalopoli, Melite
ΜΕΓ. Μεγαλος, Great
ΜΕΣ. Meſſana
ΜΕΤΑ. Metapontum
Μ. ΜΗΤΡΟ. Metropolis
ΜΙ. Miletus
ΜΚ. Mazaka of Cappadocia, on coins of Mithridates VI.
ΜΟΡ. Morgantia
ΜΥ. Mycenæ.
ΜΥΡ. Myrlea
ΜΥΤΙ. Mytilene
Ν
Ν. Naupactus
ΝΑΞ. Naxos
ΝΑΥΑΡΧ. Ναυαρχιδοι, enjoying a ſea-port.
ΝΕ. Nemea
Ν. ΝΕΩΚ. Neocori
ΝΕΟΠ. Neopolis.
ΝΕΡ. Nerva
ΝΙΚ. Nicæum, Nicomedia
ΝΥΕ. Nyſæi, on coins of Scythopolis, *Pell.*
Ο
ΟΙ. Oethæi
ΟΝ. Οντος, being
ΟΠΕΛ. Opelius
ΟΠ. Opus
ΟΡΥ. Orycas
ΟΡΧ. Orchomenus
ΟΥΠ. or ΥΠ. Ουπατος or Υπατος, Conſul
ΟΥΕΡ. Verus
ΟΥΗ. Verus
ΟΥΕΣΠ. Veſpaſianus
ΟΥΙΤΕΛ. Vitellius
ΟΦΡΥ. Ophrynium
Π
Π. Παρα, προς, upon
Π. ΠΟΠΛ. Publius
Π. ΠΑ. Paphos or Paros
ΠΑΙΣ. Pæſtum
ΠΑΝ. Panormus
ΠΑΡ. Paropinum
ΠΑΡΙ. Paros
ΠΑΡΘ. Parthicus
ΠΕ. Perinthus
ΠΕΛ. Pella
ΠΕΡ. Pergus
ΠΕΡΤ. Pertinax
ΠΕΣΚ. Peſcennius
Π. ΠΗ. Peluſium
ΠΙΝ. Pinamytæ
ΠΛΑ. Plateæ
ΠΟ. Pontus
ΠΟΛΥ. Polyrrhenum
ΠΟΣ. Poſidonia
ΠΡΑΣ. Praſus
Π. ΠΡΥ. Πρυτανις, Præfect
ΠΡ. ΠΡΕΣ. Πρεσϐεις, Legate
ΠΡΟ. Proconneſus
ΠΡΟΔΙ. Προδικος, Curator
Π. ΠΡΩΤ. Πρωτος, Firſt
ΠΤ. Ptolemais
ΠΥ. Pylos
Ρ
ΡΟ. Rhodes
Σ
Σ ΣΑ. Salamis, Samos, Syria
ΣΑ. Samoſate
ΣΑΛΑΠ. Salapia
ΣΑΡ. Sardis
ΣΕ. Seriphus, Segeſte
ΣΕΒ. Σεϐαστος, Auguſtus
ΣΕΛ. Selinus, Seleucia
ΣΕΠΤ. Septimius
ΣΙ. Siphnos
ΣΙΔ. Side
ΣΙΝΩ. Sinope
ΣΜΥ. Smyrna
ΣΤΡ. ΣΤΡΑ. Στρατηγος, Prætor
ΣΥΒ. Sybaris
ΣΥ. ΣΥΡΑ. Syracuſe
ΣΥΡ. Syria
ΣΩ. Solæ.
Τ.
Τ. Titus
ΤΑΒΑΛ. Tabala
ΤΑ. ΤΑΝΑ. Tanagra
ΤΑΡ. Tarentum, Tarſus
ΤΑΥΡ. Tauromenum
ΤΕ. Tementis
ΤΕΡ. Terina
ΤΗ. Tenus
ΤΙ. ΤΙΒ. Tiberius
ΤΡΑ. Trallis
ΤΡΙ. Tripolis.
ΤΡΟ. Troizene
ΤΥΑΝ. Tyana
ΤΥ. Tyndaris
ΤΥΡ. Tyre (monogram)
Υ
ΥΕ. ΥΕΛ. Velia
ΥΠ. ΥΠΑΤ. Υπατος, Conſul
Φ
Φ. Philip; Phœſtus, Philuntium
ΦΑ. Phaſelis
ΦΑΡ. Pharſalus
ΦΙ. Vibius, Phillippopolis
ΦΙΝΕ. Phineium
ΦΛ. Flavius
ΦΟΚ. Phoceum
ΦΟΥΛ. Fulvia
ΦΥ. Phycus in Cyrene
Χ
Χ. Chios
ΧΑΛ. Chalſis
ΧΕΡ. Cherſoneſus
ΧΙ. Chytri in Crete

Abbreviations.

Greek Numerals.

Α.	1.	Ι.	10.	Ρ.	100.
Β.	2.	Κ.	20.	ϕ. or C	200.
Γ.	3.	Λ.	30.	Τ.	300.
Δ.	4.	Μ.	40.	Υ.	400.
Ε	5.	Ν.	50.	Φ.	500.
ς. or ≌	6.	Ξ.	60.	Χ.	600.
Ζ.	7.	Ο.	70.	Ψ.	700.
Η.	8.	Π.	80..	Ω.	800.
Θ.	9.	q or ч	90.	q.	900.

Examples. I is 10: add A or I, and IA makes 11: ſo IB, 12; IΓ, 13, &c. K is 20, KA, 21, &c. PIA makes 111. The Engliſh word AIR marks the grand initial numerals. On coins the numerals are often placed in retrograde order; which makes no difference in the value, as every letter is appropriated to its number. Thus TAΓ or ΓAT imply the ſame, 333. But the advantage being unknown to the Roman numerals and Arabic ciphers, is apt to puzzle the beginner.

Roman Coins.

A

A. AULUS: in the exergue it implies the firſt mint, as ANT. A. coined at Antioch in the firſt mint.
A. A. A. F. F. Auro, Argento, Ære, Flando, Feriundo.
A. or AN.. Annus.
A. A. Apollo Auguſti.
A. F. A. N. Auli filius, Auli nepos.
ABN. Abnepos.
ACT. Actiacus, or Actium.
AD. FRV. EMV. Ad fruges emundas.
ADIAB. Adiabenicus.
ADOP. Adoptatus.
ADQ. Adquiſita.
ADV Adventus.
AED. Ædes.
AED. P. Ædilitia poteſtate.
AED. S. Ædes ſacræ.
AED. CVR. Ædilis Curules.
AED. PL. Ædilis Plebis.
AEL. Ælius.
AEM. or AIMIL. Æmilius.
AET. Æternitas.
AFR. Africa, or Africanus.
ALBIN. Albinus.
ALIM. ITAL. Alimenta Italiæ.
ANN. AVG. Annona Auguſti.
A. N. F.F. Annum Novum Fauſtum Felicem.
ANIC. Anicius.
ANN. DCCCLXIIII. NAT. VRB. P. CIR. CON. Anno 864 Natali Urbis Populo Circenſes conſtituti.
ANT. AVG. Antonius Augur.
ANT. Antonius, or Antoninus.
AP. Appius.
A. P. F. Argento Publico Feriundo.
A. POP. FRVG. AC. A Populo Fruges Acceptæ.
AQ. or AQL. Aquilius.
AQVA MAR. Aqua Martia.
ARAB. ADQ. Arabia Adquiſita.
ARR. Arrius.
AVG. Augur, Auguſtus, Auguſta.
AVG. D. F. Auguſtus Divi Filius.
AVGG. Two Auguſti.
AVGGG. Three Auguſti.
AVR. or AVREL. Aurelius.

B

B. The mark of the ſecond mint in any city.
BON. EVENT. Bonus Eventus.
B.R.P. NAT. Bono Reipublicæ Nato.
BRIT. Britanicus.
BRVT. Brutus.

C

C. Caius, Colonia.
C. A. Cæſarea Auguſta.
C. CAE. or CAES. Cæſar.
CAESS. Cæſares.
CARTH. Carthage.
CEN. Cenſor.
CENS. P. Cenſor Perpetuus.
CEST. Ceſtius, or Ceſtianus.
CIR. CON. Circum Condidit, or Circenſes Conceſſit.
CIVIB. ET SIGN. MILIT. A. PARTH. RECVP. Civibus et Signis Militaribus a Parthis Recuperatus.
CN. Cneius.
COEL. Cœlius.
CON. OB. Conſtantinopoli Obſignata, or Conſtantinopoli Officina ſecunda, or Conflata Obryzo.
COL. Colonia.
CON. SVO. Conſervatori ſuo.
CONCORD. Concordia.
CL. V. Clypeus Votivus.
COMM. Commodus.
CLOD. Clodius.
CL. or CLAVD. Claudius.
COS. Conſul.
COSS. Conſules.
CORN. Cornelius.
CVR. X. F. Curavit Denarium Faciendum.

D

D. Decimus, Divus, Deſignatus.
DAC. Dacicus.
D. F. Dacia felix.
D. M. Diis Manibus.
DES. or DESIG. Deſignatus.
DICT. Dictator.
DOMIT. Domitianus.
D. N. Dominus noſter.
DID. Didius.
D. P. Dii Penates.
DV. Divus.

E

EID. MAR. Idus Martiæ.
EX. CONS. D. Ex Conſenſu Decuriorum.
EX. S. C. Ex Senatus Conſulto.
EQ. ORDIN. Equeſtris Ordinis.
EX. A. PV. Ex Argento, or Auctoritate Publica.
EXER. Exercitus.
ETR. Etruſcus.

F.

F. Filius, or Filia, or Felix, or Faciundum, or Fecit.
FEL. Felix.
FELIC. Felicitas.
FL. Flavius.
FLAM. Flamen.
FORT. RED. Fortunæ Reduci.
FOVRI. Fourius for Furius.
FONT. Fonteius.
FRVGIF. Frugiferæ (Cereri).
FVL. Fulvius.
FVLG. Fulgerator.

G

G. Gneius, Genius, Gaudium.
GA. Gaditanus.
G. D. Germanicus Dacicus.
GEN. Genius.
GERM. Germanicus.
GL. E. R. Gloria Exercitus Romani.
GL. P. R. Gloria Populi Romani.
GOTH. Gothicus.
G. P. R. Genio Populi Romani.
G. T. A. Genius Tutelaris Ægypti, or Africæ.

H

HEL. Helvius.
HEL. Heliopolis.
HER. Herennius, or Herennia.
HO. Honos.
HS. Seſtertius.

I

I. Imperator, Jovi, Julius.
IAN. CLV. Janum cluſit for clauſit.
IMP. Imperator.
IMPP. Imperatores.
I. S. M. R. Juno Soſpita, Mater or Magna Regina.
IT. Italia, Iterum.
ITE. Iterum.
IVL. Julius or Julia.
IVST. Juſtus.
I-I. S. Seſtertius.
I. O. M. SACR. Jovi Optimo, Maximo, Sacrum.
II. VIR. Duumvir.
III. VIR. R. P. C. Triumvir Reipublicæ Conſtituendæ.
IIII. VIR. A. P. F. Quatuorvir, or Quatuorviri, Auro, or Argento, or Ære, Publico Feriundo.
IVN. Junior.

L

L. Lucius.
LAT. Latinus.
LEG. PROPR. Legatus Proprætoris.
LEG. I. &c. Legio Prima, &c.
LEP. Lepidus.
LENT. CVR. X. F. Lentulus Curavit Denarium Faciundum.
LIBERO P. LIBERO Patri.
LIB. PVB. Libertas Publica.
LIC. Licinius.
L. S. DEN. Lucius Sicinius Dentatus.
LVC. Lucifera.
LVD. CIR. Ludi Circenſes.
LVD. EQ. Ludi Equeſtres.
LVD. SAEC. F. Ludos Sæculares Fecit.

Abreviations.

M

M. Marcus, or Marius.
MAR. CL. Marcellus Clodius.
M. F. Marci Filius.
M. OTACIL. Marcia Otacilia.
MAG. or MAGN. Magnus.
MAC. Macellum.
MAX. Maximus.
MAR. Martia (aqua).
MAR. VLT. Marti Ultori.
MES Meſſius.
METAL. Metallum.
MINAT. Minatius.
MINER. Minerva.
M. M. I. V. Municipes Municipii Julii Uticenſis.
MON. or MONET. Moneta.

N

N. Nepos or noſter.
N. C. Nobiliſſimus Cæſar.
NAT. VRB. Natalis Urbis.
NEP. Nepos.
NEP. RED. Neptuno Reduci.

O

O. Optimo.
OB. C. S. Ob Cives Servatos.
OF. Officina.
OPEL. Opelius.
ORB. TERR. Orbis Terrarum.

P

P. or POT. Poteſtate.
PAC. ORB. TER. Pacatori Orbis Terrarum.
PAPI. Papius or Papirius.
PARTH. Parthicus.
PERP. Perpetuus.
PERT. or PERTIN. Pertinax.
PESC. Peſcennius.
P. F. Pius Felix.
PLAET. Plætonius.
P. L. N. Pecunia Londini Notata.
P. LON. S. Pecunia Londini Signata
P. M. or PONT. MAX. Pontifex. Maximus
POMP. Pompeius.
P. P. Pater Patriæ.
PR. Prætor.
P. R. Populus Romanus.
PRAEF. CLAS. ET. OR. MARIT. Præfectus Claſſis et Oræ Maritimæ.
PRINC. IVVENT. Princeps Juventutis.
PRIV. Privernum.
PROC. Proconſul.
PRON. Pronepos.
PROP. Proprætor.
PROQ. Proquæſtor.
PROV. DEOR. Providentia Deorum.
PVPIEM. Pupienus.

Q

Q. Quintus, or Quæſtor.
Q. C. M. P. I. Quintus Cæcilius Metellus Pius Imperator.
Q. DESIG. Quæſtor Deſignatus.
Q. P. Quæſtor Prætorius.
Q. PR. Quæſtor provincialis.

R

R. Roma, Reſtituit.
RECEP. Receptis, or Receptus.
REST. Reſtituit.
ROM. ET AVG. Romæ et Auguſto.
R. P. Reſpublica.

S

SAEC. AVR. Sæculum Aureum.
SAEC. FEL. Sæculi Felicitas.
SAL. Salus.
SALL. Salluſtia.
SARM. Sarmaticus.
S. C. Senatus Conſulto.
SCIP. ASIA. Scipio Aſiaticus.
SEC. ORB. Securitas Orbis
SEC. PERP. Securitas Perpetua.
SEC. TEMP. Securitas Temporum.
SEN. Senior.
SEPT. Septimius.
SER. Servius.
SEV. Severus.
SEX. Sextus.
SIC. V. SIC X. Sicut Quinquennalia, ſic Decennalia.
SIG. Signis.
S. M. Signata Moneta.
S. P. Q. R. Senatus Populuſque Romanus.
STABIL. Stabilita (terra).
SVL. Sulla.

T

T. Titus, Tribunnus.
TER. Terentius, or Tertium.
TEMP. Temporum.
TI. Tiberius.
TR. or TREV. Treveris.
TREB. Trebonianus.
TR. MIL. Tribunus Militaris.
TR. A. or TRIB. POT. Tribunicia Poteſtate.

V

V. Quintum.
V. C. Vir Clariſſimus.
VESP. Veſpaſianus.
VIB. Vibius.
VICT. Victoria.
VII. VIR. EPVL. Septemvir Epulonum.
VIL. PVB. Villa Publica.
VIRT. Virtus.
VN. MR. Venerandæ Memoriæ.
VOT. X. MVLT. XX. Votis Decennalibus Multiplicatis Vicennalibus.

X

X. Decem, Denarius.
XV. VIR. SACR. FAC. Quindecim Vir Sacris Faciundis.

Abbreviations on the Exergue; from Banduri and Monaldini. Pinkerton.

A. Officina Prima.
ALE. Alexandria.
AMB. Antiochenſis Moneta Secundæ Officinæ.
AN. ANT. ANTI. Antiochia.
ANB. Antiochiæ Secunda Officina: to ANH. Antiochiæ Octava Officina.
A. P. L. (In officina) Prima percuſſa Lugduni.
AQ. AQL. Aquileiæ.
AQ. O. B. F. Aquileiæ Officinæ Secundæ Fabrica.
AQ. P. S. Aquileiæ Pecunia Signata.
AQ. S. Aquileiæ Signata.
A. AR. ARL. Arelate.
A. SISC. Prima (in officina) Siſciæ.
B. SIRM. Secunda Sirmii.
B. S. L. C. Secunda Signata Lugduni.
C. Θ. Conſtantinopoli Nona.
COMOB. Conflata Moneta Obryzo. Only on gold or ſilver from a gold dye.
CON. Conſtantinopoli.
CONOB. Conflata Obryzo. Only on gold.
CONS. Conſtantinopoli.
KART. Carthago.
K. O. Carthaginenſis Officina.
L. LC. LVC. LVG. Lucduni, Lugduni.
L. LON. Londini.
L. P. Lugdunenſis vel Londinenſis Pecunia.
LVC. P. S. Lugduni Pecunia Signata.
MOPS. Mediolani Pecunia Signata.

Abreviations.

M. K. V. T. Moneta Kartaginenſis Urbis (in officina) Tertia.
M. L. Moneta Lugdunenſis vel Londinenſis.
MOSTT. Moneta Officinæ Secundæ Treverorum.
MSTR. Moneta Signata Treveris.
O. Officina.
OFF. III. CONST. Officina Tertia Conſtantinopoli.
PARL. Percuſſa or Pecunia Arelate.
PLON. Pecunia Londinenſis.
PLVG. Pecunia Lugdunenſis.
P. R. Pecunia Romana, or Percuſa Romæ.
P. T. Pecunia Treverenſis.
Q. AR. Quincta Arelatenſis (officina).
R. RO. ROM. Romæ.
RA. Ravennæ.
ROPS. Romæ Pecunia Signata.
S. AR. Signata Arelate.
S. CONST. Signata Conſtantinopoli.
SIS. Siſciæ.
SS. P. Siſcienſis Pecunia.
SISC. V. Siſcia Urbs.
SMA. Signata Moneta Antiochiæ.
S. M. HER. Signata Moneta Heracleæ.
S. M. N. Signata Moneta Nicomediæ.
S. M. R. Signata Moneta Romæ.
S. T. Signata Treveris.
TESOB. Teſſalonicæ Officina Secunda.
THEOPO. Theopoli.
TR. Treveris.
TROB. Treveris Officina Secunda.

A Liſt of Roman Colonies whoſe Coins remain, and Abbreviations on theſe Coins.

Abdera in Spain.
Acci in Spain.
Achulla in Africa.
Ælia Capitolina in Judæa.
Agrippina in Germany,
Antiochia in Piſidia.
in Syria.
Apamea in Bithynia.
Arna in Theſſaly.
Aſtigi in Spain.
Babba in Mauritania Tingitana.
Berytus in Phœnicia.
Bilbilis in Spain.

Boſtra

Ancient Coins.

Boſtra in Arabia.
Bracara Auguſta in Spain.
Buthrotum in Epirus.
Cabellio in Gaul.
Cæſar-Auguſta in Spain.
Cæſarea in Paleſtine.
Calagurris in Spain.
Calpe in Spain.
Camalodunum in Britain.
Carrhæ in Meſopotamia.
Carteia in Spain.
Carthago in Africa.
Carthago Nova in Spain.
Caſcantum in Spain.
Caſſandria in Macedon.
Celſa in Spain.
Clunia in Spain.
Coillu in Numidia.
Comana in Cappadocia.
Corinthus in Greece.
Cremna in Piſidia.
Culla in Thrace.
Damaſcus in Celeſyria.
Dertoſa in Spain.
Deulton in Thrace.
Dium in Macedon.
Ebora in Spain.
Edeſſa in Meſopotamia.
Emerita in Spain.
Emeſa in Phœnicia.
Ergavica in Spain.
Germe in Galatia.
Graccuris in Spain.
Hadrumetum in Africa.
Heliopolis in Celeſyria.
Hippo Regius in Africa.
Iconium in Lycaonia.
Illerda in Spain.
Illergavonia in Spain.
Illeci in Spain.
Icl in Mauritania.
Italica in Spain.
Laelia in Spain.
Laodicea in Syria.
Leptis in Africa.
Lugdunum in Gaul.
Neapolis in Paleſtine.
Nemauſus in Gaul.
Neſibus in Meſopotamia.
Norba Cæſarea in Mauritanica.
Obulco in Spain.
Oea in Africa.
Olba in Pamphylia.
Oſca in Spain.
Oſicarda in Spain.
Panormus in Sicily.
Parium in Myſia.
Parlais in Lycaonia.
Patricia (Corduba) in Spain.
Pella in Macedon.
Philippi in Macedon.
Philippopolis in Arabia.
Ptolemais in Phœnicia.
Ruſcino in Gaul.
Romula (Hiſpalis) in Spain.
Rheſæna in Meſopotamia.
Sabaria in Hungary.
Saguntum in Spain.
Sebaſte in Paleſtine.
Segobriga in Spain.
Sidon in Phœnicia.
Singara in Meſopotamia.
Sinope in Pontus.
Stobi in Macedon.
Tarraco in Spain.
Theſſalonica in Macedon.
Traducta (Julia) in Spain.
Troas in Phrygia.
Turiaſo in Spain.
Tyana in Cappadocia.
Tyrus in Phœnicia.
Valentia in Spain.
Vienna in Gaul.
Viminacium in Mœſia.
Utica in Africa.

Abbreviations on Colonial Coins.

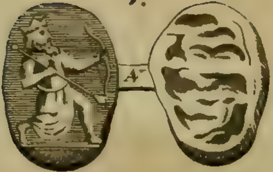
ACCI. Accitana Colonia, *Gaudix in Spain.*
ADI. Adjutrix *legio.*
AEL. MVN. COEL. Ælium Municipium Cœla, *near Seſtos on the Helleſpont.*
AST. Aſtigitana, *Eceja* in Andaluſia.
B. A. Braccara Auguſti, *Brague in Portugal.*
C. A. Cæſaria Antiochiæ.
C. A. A. P. OF PATR. Colonia Auguſta Aroe Patrenſis.
CAB. Cabellio.
C. A. BVT. Colonia Auguſti Buthrotum, *in Epirus.*
C. A. C. Colonia Auguſta Cæſarea.
C. A. I. Colonia Auguſta Julia, *Cadiz.*
C. A. E. Colonia Aug. Emerita, *Merida.*
CAL. Calagurris, *Calahora in Spain.*
C. A. O. A. F. Colonia Antoniana Oea Aug. Felix, *Tripoli in Africa.*
C. A. PI. MET. SID. Colonia Amelia Pia Metropolis Sidon.
C. A. R. Colonia Auguſta Rauracorum, or Colonia Aſta Regia. Augst. in Switzerland, or Aſt near Xeres de la Frontera in Spain.
C. C. A. Colonia Cæſarea Auguſta, *Saragoſſa in Spain.*
C. C. COL. LVG. Claudia Copia Colonia Lugdunenſis.
C. C. I. B. Colonia Campeſtris Julia Babba, *in Mauritania.*
C. C. I. B. D. D. Colonia Campeſtris Julia Babba, Decreto Decurionum.
C. C. I. H. P. A. Colonia Concordia Julia, Hadrumetina, Pia Auguſta.
C. CIV. D. D. P. Corona Civica data Decreto Publico.
C. C. N. A. Colonia Carthago Nova Auguſta.
C. C. N. C. D. D. Colonia Concordia, Norba Cæſareana, Decreto Decurionum.
C. COR. Colonia Corinthus.
C. C. T. Ducenteſima Remiſſa.
C. C. S. Colonia Claudia Sabaria, *in Hungary.*
C. F. P. D. Colonia Flavia Pacenſis Develtum, *Develtum in Thrace.*
C. G. I. H. P. A. Colonia Gemella Julia Hadrians, Pariana, Auguſta.
C. I. C. A. Colonia Julia Concordia, Apamea.
C. I. A. D. Colonia Julia Auguſta Dertona, *Tortona near Milan.*
C. I. AV. Colonia Julia Aug. *Cadiz.*
C. I. AVG. F. SIN. Colonia Julia Auguſta Felix Sinope.
C. I. B Colonia Julia Balba, *in Mauritania.*
C. I. C. A. P. A. Colonia Julia Carthago Auguſta Pia Antiqua, or Corinth, or Carthago Nova
C. I. CAL. Colonia Julia Calpe, *Gibraltar.*
C. I. F. Colonia Julia Felix, *Cadiz.*
C. I. G. A. Colonia Julia Gemella (c) Auguſta.
C. I. I. A Colonia Immunis Illice Auguſta, *Elche in Spain.*
C. I. N. C. Colonia Julia Norba Cæſareana, or Alcantara: ſometimes it means Col. Julia Nova Carthago.
C. I. V. Colonia Julia Valentia, *Valencia in Spain.*
C. V. T. Colonia Victrix Tarraco.
C. L. I. COR. Colonia Laus Julia Corinthus.
C. L. I. N. AVG. Colonia Laus Julia Nova Auguſta, *Laus or Lodi in Lucania.*
C. M. L. Colonia Metropolis Laodicea, *in Cœleſyria.*
CO. DAM. METRO. Colonia Damaſcus Metropolis.
COHH. PRET. VII. P. VI. F. Cohortes Prætorianæ Septimum Piæ, Sextum Felices.
COH. I. CR. Cohors prima Cretenſis.
COH. PRET. PHIL. Cohors Prætoriana Philippenſium.
COL. AEL. A. H. MET. Colonia Ælia Auguſta Hadrumetina Metropolis, *in Africa.*
COL. AEL. CAP. COMM. P. F. Colonia Ælia Capitolina Commodiana Pia Felix.
COL. ALEX. TROAS. Colonia Alexandriana Troas.
COL. AMAS. OF AMS. Colonia Amaſtriana, *in Paphlagonia.*
COL. ANT. *Antioch in Piſidia.*
COL. ARELAT. SEXTAN. Colonia Arelàte Sextanorum, *Arles.*
COL. AST. AVG. Colonia Aſtigitana Auguſta, *Eceja in Spain.*
COL. AVG. FEL. BER. Colonia Auguſta Felix Berytus.
COL. AVG. FIR. Colonia Aug. firma, *Eceja.*
COL. AVG. IVL. PHILIP. Colonia Auguſta Julia Philippenſis.
COL. AVG. PAT. TREVIR. Colonia Auguſta Paterna Trevirorum, *Treves in Germany, ſent from Paternum in Italy.*

(c) Gemella implies a colony drawn from two others.

MEDALS.

Plate CCXCII.

1.



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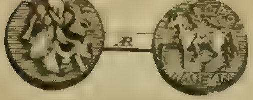

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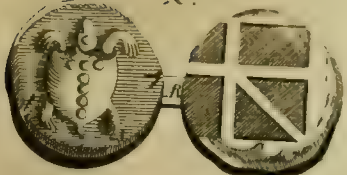

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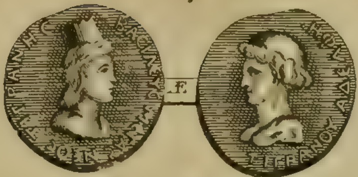

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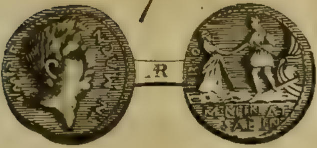

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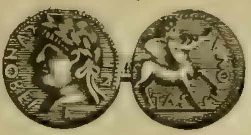

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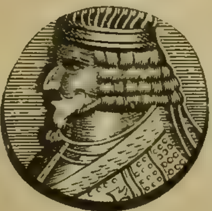

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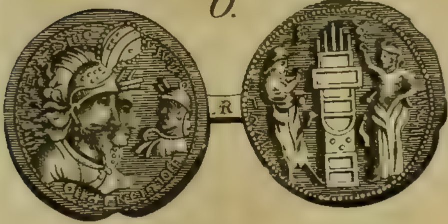

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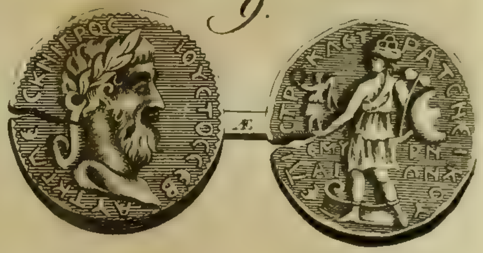

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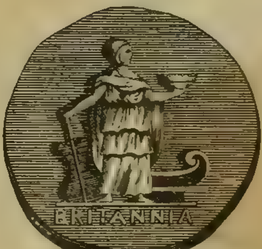

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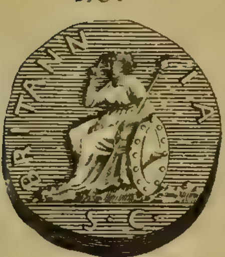

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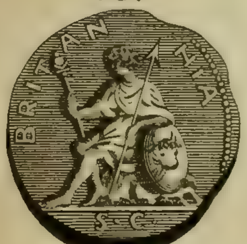

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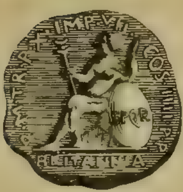

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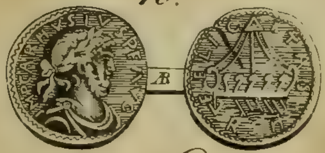

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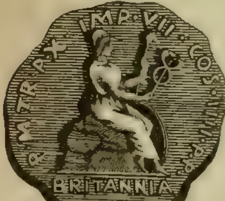

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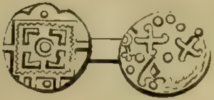

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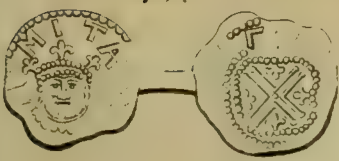

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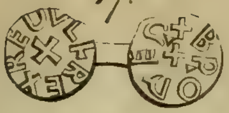

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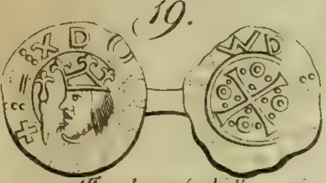

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MEDALS.

Plate CCXCIII.

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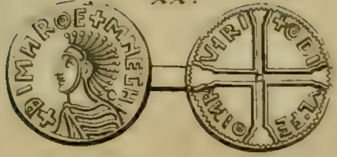

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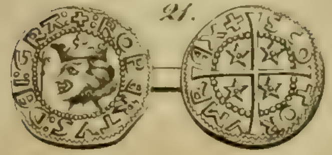

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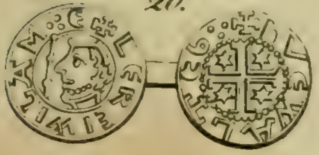

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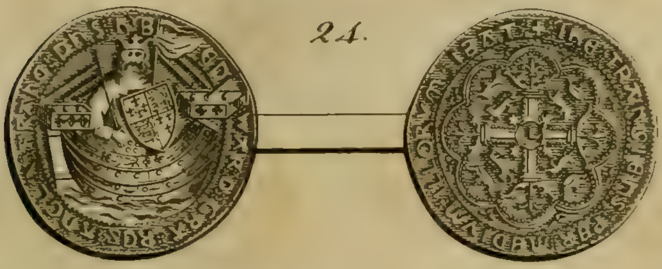

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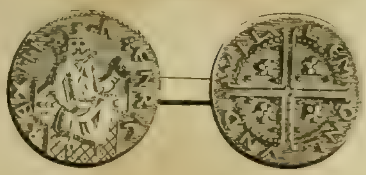

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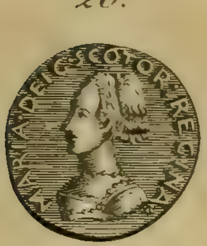

MARIA DEI G SCOTOR REGINA

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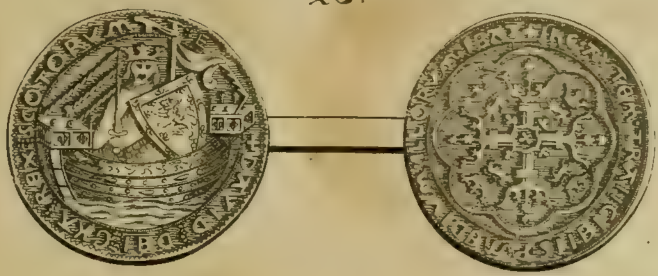

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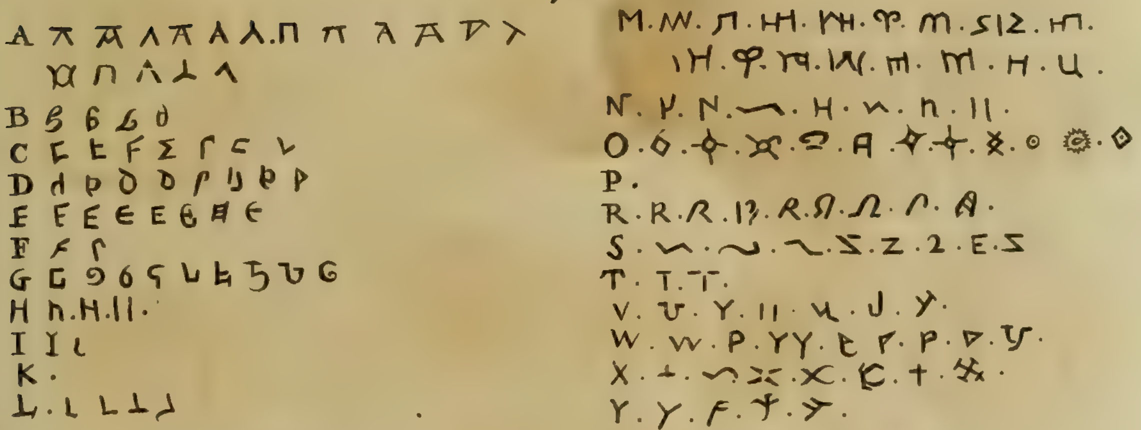

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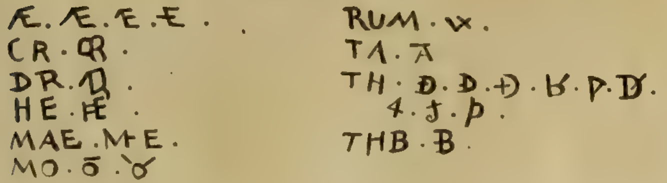

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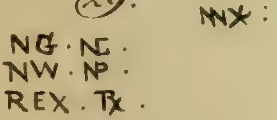

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Abbreviations.

COL. AVR. KAR. COMM. P. F. Colonia Aurelia Karrhæ Commodiana Pia Felix, or Carneatum Commagene, or *Carrhæ in Aſia*.

COL. B. A. Colonia Braccara Auguſta, *Brague*.

COL. BRYT. L. V. Colonia Berytus Legio Quinta.

COL. CABE. Colonia Cabellio.

COL. CAES. AVG. Colonia Cæſarea Auguſta, *in Paleſtine*.

COL. CAMALODVN. Colonia Camalodunum, *England*.

COL. CASILIN. Colonia Caſilinum, *Caſtellazo in Italy*.

COL. CL. PTOL. Colonia Claudia Ptolemais, *Acre in Phœnicia*.

COL. DAMAS. METRO. Colonia Damaſcus Metropolis.

COL. F. I. A. P. BARCIN. Colonia Flavia Julia Auguſta Pia, Barcino *or Barcelona*.

COL. FL. PAC. DEVLT. Colonia Flavia Pacenſis Deultum, *Develtum in Thrace*.

COL. HA ME. T. Colonia Hadriana Mercurialis Thænitana, Mercuriali, *Fermo in Italy, and Thenes in Africa*.

COL H. (or HEL.) LEG. H. Colonia Heliopolis Legio Heliopolitana.

COL. HEL. I. O. M. H. Colonia Heliopolis Jovi Optimo Maximo Heliopolitano.

COL. IVL. AVG. C. I. F. COMAN. Colonia Julia Auguſta Concordia Invicta Felix Comanorum, *drawn from Concordia in Italy, and ſent to Comana in Cappadocia*.

COL. IVL. AVG. FEL. CREMNA. Colonia Julia Auguſta Felix Cremna, *in Pamphylia*.

COL. IVL. CER. SAC. AVG. FEL. CAP. OECVM. ISE. HEL. Colonia Julia Certamen Sacrum, Auguſtum Felix Capitolinum Oecumenicum Iſelaſticum Heliopolitanum.

COL. IVL. CONC. APAM. AVG. D. D. Colonia Julia Concordia Apamea Auguſta Decreto Decurionum.

COL. IVL. PATER. NAR. Colonia Julia Paterna Narbonenſis.

COL. NEM. Colonia Nemauſus.

COL. NICEPH. COND. Colonia Nicephorium Condita, *in Meſopotamia*.

COL. PATR. Colonia Patrenſis *or* Patricia *Patrae in Greece*, or *Cordova in Spain*.

COL. P. F. AVG. F. CAES. MET. Colonia Prima Flavia Aug. Felix Cæſarea Metropolis, *in Paleſtine*.

COL. P. FL. AVG. CAES. METROP. PS. P. *ſame as above*, P. S. P. *is* Provinciæ Syriæ Paleſtinæ.

COL. PR. F. A. CAESAR. Colonia Prima Flavia Auguſta Cæſaria *in Paleſtine*.

COL. R. F. AVG. FL. C. METROP. Colonia Romanv Felix Aug. Flavia Cæſarea Metropolis. *The ſame*.

COL. ROM. Colonia Romulea, or *Seville*.

COL. ROM. LVG. Colonia Romana Lugdunum.

COL. RVS. LEG. VI. Colonia Ruſcino Legio Sexta, *Rouſſillon in France*.

COL. SABAR. Colonia Saburiæ.

COL. SABAS. Sebaſte *in Paleſtine*.

COL. SER. G. NEAPOL. Colonia Servii Galbæ Neapolis, *in Paleſtine*.

COL. V. I. CELSA, or COL. VIC. IVL. CELSA. Colonia Victrix Julia Celſa, *Kelſa in Spain*.

COL. VIC. IVL. LEP. Colonia Victrix Julia Leptis, *in Africa*.

COL. VIM. AN. I. or II, &c. Colonia Viminacium Anno primo, *Widin in Servia*.

COL. VLP. TRA. Colonia Ulpia Trajana: *Kellen*, or *Warhal in Tranſilvania*.

CO. P. F. COE. METRO. Colonia Prima Flavia Cæſarea Metropolis.

CO. P. I. A. Colonia Pacenſes Julia Auguſta, *or* Col. Octaviana.

C. R. I F. S. Colonia Romani Julia Felix Sinope.

C. T. T. Colonia Togata Tarraco.

C. V. IL. Colonia Victrix Illice, *Elche in Spain*.

D. Decuriones.

D. C. A. Divus Cæſ. Aug.

DERT. Dertoſa.

GEN. COL. NER. PATR. Genio Coloniæ Neronianæ Patrenſis.

G. L. S. Genio Loci Sacrum.

M. H. ILLERGAVONIA DRYT. Municipium Hibera Illergavonia Dertoſa, *Tortoſa in Catolonia*.

M. M. I. V. Municipes Municipii Julii Uticenſis.

M. R. Municipium Ravennatium.

MVN. CAL. IVL. Municipium Calagurris Julia, *in Spain*.

MVN. CLVN. Municipium Clunia, *Crunna in Spain*.

MVN. FANE. ÆL. Municipium Faneſtre Aelium. *Fano*.

MVN. STOB. Municipium Stobenſe, *Sobi in Macedon*.

MV. TV. Municipium Turiaſo, *in Spain*.

N. TR. ALEXANDRIANAE COL. BOSTR. Nerviæ Trojanæ Alexandrianæ Coloniæ Boſtræ, *in Paleſtine*.

SEP. COL. LAVD. Septimia Coloniæ Laudicea, *or* Laodicea.

SEP. TYR. MET. Septima Tyrus Metropolis.

Explanation of Plates.

Explanation of the Plates.

Fig. 1. A Perſian Daric.

2. A drachm of Egina.

3. A ſilver hemidrachm of Alexander the Great.

4. Tigranes the younger of Armenia, with his ſiſter.

5. One of the coins of the Arſacidæ of Parthia.

6. A coin of the Saſſanidæ of Perſia. Firſt publiſhed by Mr Pinkerton.

7. Denarius of Cneius Pompey from Mr Pinkerton, reverſe. Received by Spain.

8. A braſs coin of Cunobelinus.

6. Peſcennius Niger. Struck at Antioch; unique. In Dr Hunter's cabinet; publiſhed by Mr Pinkerton.

10. A ſilver coin of Carauſius.

11. Reverſe of Claudius in firſt braſs.

12. Reverſe of Adrian.

13. Of Antoninus Pius.

14. Of Commodus.

15. Of Severus.

16. A Saxon penny.

17. A Saxon ſtyca.

18. 19. Ancient pennies, ſuppoſed to be Scottiſh.

20 A penny of William of Scotland.

21. A penny of Robert the Great.

22. An Iriſh penny.

23. The gold penny of Henry III.

24. The large noble of the firſt coinage of Edward III.

25. The gold medal of David II. of Scotland

26. The royal of Queen Mary of Scotland.

27. Letters on Anglo-Saxon coins.

28. Abbreviations on ditto,

29. Monentarius.

Impreſſions of MEDALS. See CASTING.

MEDALLION, or MEDALION, a medal of an extraordinary ſize ſuppoſed to be anciently ſtruck by the emperors for their friends, and for foreign princes and ambaſſadors. But that the ſmalneſs of their number might not endanger the loſs of the devices they bore, the Romans generally took care to ſtamp the ſubject of them upon their ordinary coins,

Medallions, in reſpect of the other coins, were the ſame as modern medals in reſpect of the modern money: they were exempted from all commerce, and had no other value than what was ſet upon them by the fancy of the owner. Medallions are ſo ſcarce, that there cannot be any ſet made of them, even though the metals and ſizes ſhould be mixed promiſcuouſly.

MEDE (Joſeph), a very learned Engliſh divine of the 17th century, was educated at Cambridge, and ſoon diſtinguiſhed himſelf to great advantage; for by the time he had taken the degree of maſter of arts in 1610, he had made an uncommon progreſs in all academical ſtudies. His firſt appearance as a writer was by an addreſs to Dr Andrews, then biſhop of Ely, in a Latin tract *De Sanctitate Relativa*, which was highly approved of by that prelate, who deſired him to be his domeſtic chaplain. This Mr Mede very civilly refuſed; valuing the liberty of his ſtudies above any hopes of preferment, and eſteeming that freedom which he enjoyed in his cell, ſo he uſed to call it, as the haven of all his wiſhes. And indeed theſe thoughts had poſſeſſed him betimes; for when he was a ſchool-boy, he was ſent to by his uncle, Mr Richard Mede, a merchant, who, being then without children, offered to adopt him for his ſon if he would live with him; but he refuſed the offer, preferring, as it would ſeem, a life of ſtudy to a life of gain.

He was not choſen fellow of his college till after he was maſter of arts, and then not without the aſſiſtance of his friend biſhop Andrews: for he had been paſſed over at ſeveral elections, on account of a cauſeleſs ſuſpicion which Dr Cary, then maſter of the college, afterwards biſhop of Exeter, had conceived of him, that "he looked too much towards Geneva." Being made fellow, he became an eminent and faithful tutor. After he had well grounded his pupils in humanity, logic, and philoſophy, ſo that they were able to walk as it were alone, he uſed to ſet every one his daily taſk; which he rather choſe, than to confine himſelf and them to preciſe hours for lectures. In the evening they all came to his chamber; and the firſt queſtion he put to each was, *Quid dubitas?* "What doubts have you met with in your ſtudies to-day?" For he ſuppoſed, that to doubt nothing and to underſtand nothing was juſt the ſame thing. This was right, and the beſt method to make young men exerciſe their rational powers, and not acquieſce in what they learn mechanically, and by rote, with an indolence of ſpirit which prepares them to receive and ſwallow implicitly whatever is offered to them. As to himſelf, he was ſo entirely devoted to the ſtudy of all excellent knowledge, that he made even the time he ſpent in his amuſements ſerviceable to his purpoſe. He allowed himſelf little or no exerciſe but walking; and often, in the fields or college garden, would take occaſion to ſpeak of the beauty, ſignatures, virtues, or properties of the plants then in view, for he was a curious floriſt, an accurate herbaliſt, and thoroughly verſed in the book of nature. The chief delight he took in company was to diſcourſe with learned friends.

Mr Mede was a curious inquirer into the moſt abſtruſe parts of learning, and endeavoured after the knowledge of thoſe things which were more remote from the vulgar track. Among other things, he ſpent no ſmall pains and time in ſounding the depths of aſtrology, and blotted much paper in calculating the nativities of his near relations and fellow-ſtudents: but this was in his younger years, and he afterwards diſcovered the vanity and weakneſs of this fanciful art. He applied himſelf to the more uſeful ſtudy of hiſtory and antiquities; particularly to thoſe myſterious ſciences which made the ancient Chaldeans, Egyptians, and other nations, ſo famous; tracing them as far as he could have any light to guide him in their oriental ſchemes and figurative expreſſions, as likewiſe in their hieroglyphics, not forgetting to inquire alſo into the oneirocritics of the ancients; which he did the rather, becauſe of that affinity he conceived they might have with the language of the prophets. He was a curious and laborious ſearcher of antiquities relating to religion, ethnic, Jewiſh, Chriſtian, and Mahometan: to which he added other attendants, neceſſary for underſtanding the more difficult parts of Scripture.

In 1620, he refuſed the provoſtſhip of Trinity-college, Dublin, into which he had been elected at the recommendation of archbiſhop Uſher, who was his particular friend; as he did alſo when it was offered to him a ſecond time, in 1630. The height of his ambition was, only to have had ſome ſmall donative ſinecure added to his fellowſhip, or to have been thrown into ſome place of quiet; where, retired from the noiſe and tumults of the world, and poſſeſſed of a competency of fortune, he might have been entirely at leiſure for ſtudy and acts of piety. In the mean time, although his circumſtances were ſcanty, for he had nothing but his fellowſhip and a college lecture, his charity was diffuſive and uncommon; and, ſtrange as it may now ſeem, he devoted the tenth of his income to pious and charitable uſes. But his frugality and temperance always afforded him plenty. His prudence or moderation, either in declaring or defending his private opinions, was very remarkable; as was alſo his freedom from partiality, prejudice or prepoſſeſſion, pride, anger, ſelfiſhneſs, flattery, and ambition. He was meek, patient, equally remote from ſuperſtition and licentiouſneſs of thinking; and, in ſhort poſſeſſed every virtue. This great and good man died in 1638, in his 52d year, having ſpent above two-thirds of his time in college.

MEDEA, in fabulous hiſtory, a celebrated ſorcereſs, daughter of Æetes king of Colchis. Her mother's name, according to the more received opinion of Heſiod and Hyginus, was Idyia, or, according to others, Ephyre, Hecate, Aſterodia, Antiope, and Neæra. She was the neice of Circe. When Jaſon came to Colchis in queſt of the golden fleece, Medea became enamoured of him, and it was to her well-directed labours that the Argonauts owed their preſervation. Medea had an interview with her lover in the temple of Hecate; when they bound themſelves by the moſt ſolemn oaths to eternal fidelity. No ſooner had Jaſon overcome all the difficulties which Æetes had placed in his way, than Medea embarked with the conquerors for

Greece. To ſtop the purſuit of her father, ſhe tore to pieces her brother Abſyrtus, and left his mangled limbs in the way through which Æetes was to paſs. This act of barbarity, ſome have attributed to Jaſon, and not to her. When Jaſon reached Iolchos his native country, the return and victories of the Argonauts were celebrated with univerſal rejoicings; but Æſon the father of Jaſon was unable to aſſiſt at the ſolemnity on account of the infirmities of his age. Medea, at her huſband's requeſt, removed the weakneſs of Æſon; and by drawing away the blood from his veins, and filling them again with the juice of certain herbs, ſhe reſtored him to the vigour and ſprightlineſs of youth. This ſudden change in Æſon aſtoniſhed the inhabitants of Iolchos; and the daughters of Pelias were deſirous to ſee their father reſtored by the ſame power to the vigour of youth. Medea, willing to revenge the injuries which her huſband's family had ſuffered from Pelias, increaſed their curioſity; and betrayed them into the murder of their father as preparatory to his rejuveneſcence, which ſhe afterwards refuſed to accompliſh. This action greatly irritated the people of Iolchos; and Medea with her huſband fled to Corinth to avoid their reſentment. Here they lived for 10 years with mutual attachment, when the love of Jaſon for Glauce the king's daughter interrupted their harmony, and Medea was divorced. Medea revenged the infidelity of Jaſon, by cauſing the death of Glauce, and the deſtruction of her family. She alſo killed two of her children in their father's preſence; and when Jaſon attempted to puniſh the barbarity of the mother, ſhe fled through the air upon a chariot drawn by winged dragons. From Corinth Medea came to Athens, where, after ſhe had undergone the neceſſary purification of her murder, ſhe married king Ægeus, or (according to others) lived in an adulterous manner with him. From her conduct with Ægeus, Medea had a ſon who was called *Medus*. Soon after, when Theſeus wiſhed to make himſelf known to his father, Medea, jealous of his fame and fearful of his power, attempted to poiſon him at a feaſt which had been prepared for his entertainment. Her attempts, however, failed of ſucceſs, and the ſight of the ſword which Theſeus wore by his ſide convinced Ægeus that the ſtranger againſt whoſe life he had ſo baſely conſpired was his own ſon. The father and the ſon were reconciled; and Medea, to avoid the puniſhment which her wickedneſs deſerved, mounted her fiery chariot and diſappeared through the air. She came to Colchis; where according to ſome, ſhe was reconciled to Jaſon, who had ſought her in her native country after her ſudden departure from Corinth. She died at Colchis, as Juſtin mentions, when ſhe had been reſtored to the confidence of her family. After death ſhe married Achilles in the Elyſian fields, according to the traditions mentioned by Simonides. The murder of Mimerus and Pheres, the youngeſt of Jaſon's children by Medea, is not to be attributed to the mother, according to Elian; but to the Corinthians, who aſſaſſinated them in the temple of Juno Acræa. To avoid the reſentment of the gods, and to deliver themſelves from the peſtilence which viſited their country after ſo horrid a maſſacre, they engaged the poet Euripides for five talents to write a tragedy, which cleared them of the murder, and repreſented Medea as the cruel aſſaſſin of her own children. And beſides, that this opinion might be the better credited, feſtivals were appointed, in which the mother was repreſented with all the barbarity of a fury murdering her own ſons.

MEDEOLA, CLIMBING AFRICAN ASPARAGUS, in botany: A genus of the hexandria order, belonging to the trigynia claſs of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. There is no calyx; the corolla is ſexpartite and revoluted; the berry triſpermous. Its characters are theſe: The flower has no impalement; it has ſix oblong oval petals, and ſix awl-ſhaped ſtamina terminated by incumbent ſummits; and three horned germina terminating the ſtyle; the germina afterward turn to a roundiſh trifid berry with three cells, each containing one heart-ſhaped ſeed. There are two ſpecies.

MEDIA, now the province of GHILAN in Perſia, once the ſeat of a potent empire, was bounded according to Ptolemy, on the north by part of the Caſpain Sea; on the ſouth by Perſis, Suſiana, and Aſſyria; on the eaſt by Parthia and Hyrcania; and on the weſt by Armenia Major. It was anciently divided into ſeveral provinces, *viz.* Tropatene, Charomithrene, Darites, Marciane, Armariace, and Syro-Media. By a later diviſion, however, all theſe were reduced to two; the one called *Media Magna*, the other *Media Atropatene*, or ſimple *Atropatene*. Media Magna was bounded by Perſis, Parthia, Hyrcania, the Hyrcanian Sea, and Atropatene, and contained the cities of Ecbatan, Laodicea, Apamea, Raga, Rageia or Ragea, &c. Atropatene lay between the Caſpian mountains and the Caſpian Sea.

This country originally took its name from Madai, the third ſon of Japhet; as is plain from Scripture, where the Medes are conſtantly called *Madai*. Among profane authors, ſome derive the name *Media*, from one Medus the ſon of Jaſon and Medea; others from a city called *Media*. Sextus Rufus tells us that in his time it was called *Medena*, and from others we learn that it was alſo called *Aria*. The moſt probable hiſtory of the Medes is as follows.

This people lived in ſubjection to the Aſſyrians till the reign of Sennacherib, when they threw off the yoke, and lived for ſome time in a ſtate of anarchy. But at laſt, rapine and violence, the natural conſequences of ſuch a ſituation, prevailed ſo much that they were conſtrained to have recourſe to ſome kind of government, that they might be enabled to live in ſafety. Accordingly, about 699 B. C. one Dejoces having procured himſelf to be choſen king, united the ſcattered tribes into which the Medes were at that time divided; and having applied himſelf as much as poſſible to the civilization of his barbarous ſubjects, left the throne to his ſon Phraortes, after a reign of 53 years.

The new king, who was of a warlike and enterpriſing diſpoſition, ſubdued almoſt all the Upper Aſia lying between Mount Taurus and the river Halys which runs through Cappadocia into the Euxine Sea. Elated with this good ſucceſs, he invaded Aſſyria, the empire of which was now much declined, and greatly weakened by the revolt of many nations which had followed the example of the Medes. Nebuchodonoſor or Chyniladan, however, the reigning prince, having aſſembled what forces he could, engaged Phraortes, defeated, took him priſoner, and put him to death; after which, entering Media, he laid waſte the country, took the metropolis of Ecbatan itſelf, and levelled it with the ground.

On the death of Phraortes, his ſon Cyaxares was placed on the throne. He was no leſs valiant and enterpriſing than his father, and had better ſucceſs againſt the Aſſyrians. With the remains of that army which had been defeated under his father, he not only drove the conquerors out of Media, but obliged Chyniladan to ſhut himſelf up in Nineveh. To this place he immediately laid cloſe ſiege; but was obliged to give over the enterprize on account of an irruption of the Scythians into his own country. Cyaxares engaged theſe new enemies with great reſolution; but was utterly defeated; and the conquerors over-ran not only all Media, but the greateſt part of Upper Aſia, extending their conqueſts into Syria, and as far as the confines of Egypt. They continued maſters of all this vaſt tract of country for 28 years, till at laſt Media was delivered from their yoke by a general maſſacre at the inſtigation of Cyaxares.

After this deliverance, the Medes ſoon repoſſeſſed themſelves of the territories they had loſt; and once more extended their frontiers to the river Halys, their ancient boundary to the weſtward. After this we find the Medes engaged in a war with the Lydians; which, however, ended without any remarkable tranſaction; but on the concluſion of it, Cyaxares having entered into a ſtrict alliance with Nebuchadnezzar king of Babylon, returned in conjunction with the Babylonians before Nineveh; which they took and levelled with the ground, putting moſt of the inhabitants to the ſword.

After this victory the Babylonian and Median empires ſeem to have been united: however, after, the death of Nebuchadnezzar, or rather in his lifetime, a war enſued, which was not extinguiſhed but by the diſſolution of the Babylonian empire. The Medes, under Aſtyages the ſon of Cyaxares I. withſtood the power of the Babylonian monarchs; and under Cyrus and Cyaxares II. utterly deſtroyed their empire by the taking of Babylon, as is related under that article. After the death of Cyaxares, the kingdom fell to Cyrus, by whom the ſeat of the empire was transferred to Persia, under which article the hiſtory of Media now falls to be conſidered, as alſo the manners, &c. of the inhabitants.

MEDIANA, the name of a vein or little veſſel, made by the union of the cephalic and baſilic, in the bend of the elbow.

MEDIASTINUM, in anatomy, a double membrane, formed by a duplicature of the pleura; ſerving to divide the thorax and the lungs into two parts, and to ſuſtain the viſcera, and prevent their falling from one ſide of the thorax to the other. See Anatomy, n° 117.

MEDIATE, or Intermediate, ſomething that ſtands betwixt and connects two or more terms conſidered as extremes; in which ſenſe it ſtands oppoſed to *immediate*.

MEDIATOR, a perſon that manages or tranſacts between two parties at variance in order to reconcile them. The word, in Scripture, is applied, 1. To Jeſus Chriſt, who is the only interceſſor and peace-maker between God and man, (1. Tim. ii. 5.) 2. to Moſes, who interpoſed between the Lord and his people, to declare unto them his word; (Deut. v. 5. iii. 19.)

MEDICAGO, Snail-trefoil, in botany: A genus of the decandria order, belonging to the diadelphia claſs of plants, and in the natural method ranking under the 32d order, *Papilionaceæ*. The legumen is compreſſed and ſcrewed; the carina of the corolla luring down from the vexillum. There are nine ſpecies, though only five are commonly cultivated in Britain. They are low trailing plants, adorned with ſmall yellow flowers, ſucceeded by ſmall, round, ſnail-ſhaped fruit, which are downy, and armed with a few ſhort ſpines. They are all eaſily propagated by ſeeds. For the properties and culture of Lucern, a ſpecies of this genus, ſee Agriculture, n° 183.

MEDICINAL, any thing belonging to medicine.

Medicinal Springs, a general name for any fountain, the waters of which are of uſe for removing certain diſorders. They are commonly either chalybeate or ſulphureous. See Springs and Water.

MEDICINE.

MEDICINE is the art of preventing, curing, or alleviating, thoſe diſeaſes to which the human ſpecies are ſubjected.

History of Medicine.

1
Origin of medicine among the Jews;

The fabulous hiſtory of the ancients derives this art immediately from their gods; and, even among the moderns, ſome are of opinion that it may juſtly be conſidered as of divine revelation. But without adopting any ſuppoſition of which no probable evidence can be given, we may conclude that mankind were naturally led to it from caſual obſervations on the diſeaſes to which they found themſelves ſubjected; and that therefore, in one ſenſe at leaſt, it is as ancient as the human race. But at what period it began to be practiſed as an art, by particular individuals following it as a profeſſion, is not known. The moſt ancient phyſicians we read of were thoſe who embalmed the patriarch Jacob by order of his ſon Joſeph. The ſacred writer ſtyles theſe phyſicians *ſervants* to Joſeph: whence we may be aſſured that they were not *prieſts*, as the firſt phyſicians are generally ſuppoſed to have been; for in that age we know the Egyptian prieſts were in ſuch high favour, that they retained their liberty, when, through a public calamity, all the reſt of the people were made ſlaves to the prince.

It is not probable, therefore, that among the Egyptians religion and medicine were originally conjoined; and if we ſuppoſe the Jews not to have invented the art, but received it from ſome other nation, it is as little probable that the prieſts of that nation were their phyſicians as thoſe of Egypt.

That the Jewiſh phyſicians were abſolutely diſtinct from their prieſts, is very certain. Yet as the Jews reſided for ſuch a long time in Egypt, it is probable they would retain many of the Egyptian cuſtoms, from which it would be very difficult to free them. We read, however, that when king Aſa was diſeaſed in

Origin of Medicine.

in his feet, "he ſought not to the Lord, but to the phyſicians." Hence we may conclude, that among the Jews the medicinal art was looked upon as a mere human invention; and it was thought that the Deity never cured diſeaſes by making people acquainted with the virtues of this or that herb, but only by his miraculous power. That the ſame opinion prevailed among the heathens who were neighbours to the Jews, is alſo probable from what we read of Ahaziah king of Judah, who having ſent meſſengers to inquire of Baal-zebub god of Ekron concerning his diſeaſe, he did not deſire any remedy from him or his prieſts, but ſimply to know whether he ſhould recover or not.

What ſeems moſt probable on this ſubject therefore is, that religion and medicine came to be mixed together only in conſequence of that degeneracy into ignorance and ſuperſtition which took place among all nations. The Egyptians, we know, came at laſt to be ſunk in the moſt ridiculous and abſurd ſuperſtition; and then, indeed, it is not wonderful to find their prieſts commencing phyſicians, and mingling charms, incantations, &c. with their remedies. That this was the caſe, though long after the days of Joſeph, we are very certain; and indeed it ſeems as natural for ignorance and barbariſm to combine religion with phyſic, as it is for a civilized and enlightened people to keep them ſeparate. Hence we ſee, that among all modern barbarians their prieſts or conjurors are their only phyſicians.

2 Among the Egyptians;

We are ſo little acquainted with the ſtate of phyſic among the Egyptians, that it is needleſs to ſay much concerning them. They attributed the invention of medicine, as they did alſo that of many other arts, to Thoth, the HERMES or MERCURY of the Greeks. He is ſaid to have writen many things in hieroglyphic characters upon certain pillars, in order to perpetuate his knowledge, and render it uſeful to others. Theſe were tranſcribed by Agathodemon, or the ſecond Mercury, the father of Tat, who is ſaid to have compoſed books of them, that were kept in the moſt ſacred places of the Egyptian temples. The exiſtence of ſuch a perſon, however, is very dubious, and many of the books aſcribed to him were accounted forgeries as long ago as the days of Galen; there is alſo great reaſon to ſuſpect that thoſe books were written many ages after Hermes, and when phyſic had made conſiderable advances. Many of the books attributed to him are trifling and ridiculous; and though ſometimes he is allowed to have all the honour of inventing the art, he is on other occaſions obliged to ſhare it with Oſiris, Iſis, and Apis or Serapis.

After all, the Egyptian phyſic appears to have been little elſe than a collection of abſurd ſuperſtitions. Origen informs us, that they believed there were 36 demons, or gods of the air, who divided the human body among them; that they had names for all of them; and that by invoking them according to the part affected, the patient was cured. Of natural medicines we hear of none recommended by the father of Egyptian phyſic; except the herb *moly*, which he gave to Ulyſſes in order to ſecure him from the inchantments of Circe; and the herb *mercury*, of which he firſt diſcovered the uſe. His ſucceſſors made uſe of veneſection, cathartics, emetics, and clyſters. There is no proof, however, that this practice was eſtabliſhed by Hermes: on the contrary the Egyptians themſelves pretend that the firſt hint of thoſe remedies was taken from ſome obſervations on brute animals. Veneſection was taught them by the hippopotamus, which is ſaid to perform this operation upon itſelf. On theſe occaſions, he comes out of the river, and ſtrikes his leg againſt a ſharp pointed reed. As he takes care to direct the ſtroke againſt a vein, the conſequence muſt be a conſiderable effuſion of blood; and this being ſuffered to run as long as the creature thinks proper, he at laſt ſtops up the orifice with mud. The hint of clyſters was taken from the ibis, a bird which is ſaid to give itſelf clyſters with its bill, &c. They uſed veneſection, however, but very little, probably on account of the warmth of the climate; and the exhibition of the remedies above-mentioned, joined with abſtinence, formed the moſt of their practice.

3 Among the Greeks,

The Greeks too had ſeveral perſons to whom they attributed the invention of phyſic, particularly Prometheus, Apollo or Pæan, and Æſculapius; which laſt was the moſt celebrated of any. But here we muſt obſerve, that as the Greeks were a very warlike people, their phyſic ſeems to have been little elſe than what is now called *ſurgery*, or the cure of wounds, fractures, &c. Hence Æſculapius, and his pupils Chiron, Machaon, and Podalirius, are celebrated by Homer only for their ſkill in curing theſe, without any mention of their attempting the cures of internal diſeaſes. We are not, however, to ſuppoſe that they confined themſelves entirely to ſurgery. They no doubt would occaſionally preſcribe for internal diſorders; but as they were moſt frequently converſant with wounds, we may naturally ſuppoſe the greateſt part of their ſkill to have conſiſted in knowing how to cure theſe. If we may believe the poets, indeed, the knowledge of medicine ſeems to have been very generally diffuſed. Almoſt all the heroes of antiquity are reported to have been phyſicians as well as warriors. Moſt of them were taught phyſic by the centaur Chiron. From him Hercules received inſtructions in the medical art, in which he is ſaid to have been no leſs expert than in feats of arms. Several plants were called by his name; whence ſome think it probable that he found out their virtues, though others are of opinion that they bore the name of this renowned hero on account of their great efficacy in removing diſeaſes. Ariſtæus king of Arcadia was alſo one of Chiron's ſcholars; and is ſuppoſed to have diſcovered the uſe of the drug called *ſilphium*, by ſome thought to be aſafætida. Theſeus, Telamon, Jaſon, Peleus, and his ſon Achilles, were all renowned for their knowledge in the art of phyſic. The laſt is ſaid to have diſcovered the uſe of verdigris in cleanſing foul ulcers. All of them, however, ſeem to have been inferior in knowledge to Palamades, who hindered the plague from coming into the Grecian camp after it had ravaged moſt of the cities of Helleſpont, and even Troy itſelf. His method was to confine his ſoldiers to a ſpare diet, and oblige them to uſe much exerciſe.

The practice of theſe ancient Greek phyſicians, notwithſtanding the praiſes beſtowed on them by their poets, ſeems to have been very limited, and in ſome caſes even pernicious. All the external remedies applied to Homer's wounded heroes were fomentations; while inwardly their phyſicians gave them wine, ſometimes mingled with cheeſe ſcraped down. A great deal of their phyſic alſo conſiſted in charms, incantations, amulets, &c. of which, as they are common to all ſuperſtitious and ignorant nations, it is ſuperfluous to take any farther notice.

In this way the art of medicine continued among the Greeks for many ages. As its firſt profeſſors knew nothing of the animal œconomy, and as little of the theory of diſeaſes, it is plain, that whatever they did muſt have been in conſequence of mere random trials, or empiriciſm, in the moſt ſtrict and proper ſenſe of the word. Indeed, it is evidently impoſſible that this or almoſt any other art could originate from another ſcource than trials of this kind. Accordingly, we find, that ſome ancient nations were accuſtomed to expoſe their ſick in temples, and by the ſides of highways, that they might receive the advice of every one who paſſed. Among the Greeks, however, Æſculapius
4 was reckoned the moſt eminent practitioner of his time, and his name continued to be revered after his death. He was ranked amongſt the gods; and the principal knowledge of the medical art remained with his family to the time of Hippocrates, who reckoned himſelf the ſeventeenth in a lineal deſcent from Æſculapius, and who was truly the firſt who treated of medicine in a regular and rational manner.

5 Hippocrates.

Hippocrates, who is ſuppoſed to have lived 400 years before the birth of Chriſt, is the moſt ancient author whoſe writings expreſsly on the ſubject of the medical art are preſerved; and he is therefore juſtly conſidered as the father of phyſic. All the accounts which we have prior to this time, if not evidently fabulous, are at the utmoſt highly conjectural. Even the medical knowledge of Pythagoras, ſo much celebrated as a philoſopher, can hardly be conſidered as reſting on any other foundation. But from the time of Hippocrates, medicine, ſeparated from philoſophy and religion, ſeems to have aſſumed the form of a ſcience, and to have been practiſed as a profeſſion. It may not, therefore, be improper to give a particular account of the ſtate of medical knowledge as tranſmitted to us in his writings. The writings of Hippocrates, however, it may be remarked, are even more than preſerved. Nor is it wonderful that attempts ſhould have been made to increaſe the value of manu-

6 His writings.

ſcripts, by attributing them to a name of ſuch eminence. But although what are tranſmitted to us under the title of his works may have been written by different hands, yet the preſumption is, that moſt, if not all of them, are of nearly as early a date, and contain the prevailing opinions of thoſe times.

According to the moſt authentic accounts, Hippocrates was a native of the iſland of Cos, and born in the beginning of the 88th Olympiad. In the writings tranſmitted to us as his, we find a general principle adopted, to which he gives the name of *Nature*. To this principle he aſcribes a mighty power. "Nature (ſays he) is of itſelf ſufficient to every animal. She performs every thing that is neceſſary to them, without needing the leaſt inſtruction from any one how to do it." Upon this footing, as if nature had been a principle endowed with knowledge, he gives her the title of *juſt*; and aſcribes virtues or powers to her, which are her ſervants, and by means of which ſhe performs all her operations in the bodies of animals: and diſtributes the blood, ſpirits, and heat, through all parts of the body, which by theſe means receive life and ſenſation. And in other places he tells us, that it is this faculty which gives nouriſhment, preſervation, and growth, to all things.

7 His idea of nature.

The manner in which nature acts, or commands her ſubſervient power to act, is by attracting what is good and agreeable to each ſpecies, and by retaining, preparing, and changing it; and on the other ſide in rejecting whatever is ſuperfluous or hurtful, after ſhe has ſeparated it from the good. This is the foundation of the doctrine of depuration, concoction, and criſis in fevers, ſo much inſiſted upon by Hippocrates and moſt other phyſicians. He ſuppoſed alſo, that every thing has an inclination to be joined to what agrees with it, and to remove from every thing contrary to it; and likewiſe that there is an affinity between the ſeveral parts of the body, by which they mutually ſympathize with each other. When he comes to explain what this principle called *nature* is, he is obliged to reſolve it into *heat*, which, he ſays, appears to have ſomething immortal in it.

8 Of the cauſes of diſeaſe.

As far as he attempts to explain the cauſes of diſeaſe, he refers much to the humours of the body, particularly to the blood and the bile. He treats alſo of the effects of ſleep, watchings, exerciſe, and reſt, and all the benefit or miſchief we may receive from them. Of all the cauſes of diſeaſes, however, mentioned by Hippocrates, the moſt general are diet and air. On the ſubject of diet he has compoſed ſeveral books, and in the choice of this he was exactly careful; and the more ſo, as his practice turned almoſt wholly upon it. He alſo conſidered the air very much; he examined what winds blew ordinarily or extraordinarily; he conſidered the irregularity of the ſeaſons, the riſing and ſetting of ſtars, or the time of certain conſtellations; alſo the time of the ſolſtices, and of the equinoxes; thoſe days, in his opinion, producing great alterations in certain diſtempers.

9 His diviſions of diſeaſes.

He does not, however, pretend to explain how, from theſe cauſes, that variety of diſtempers ariſes which is daily to be obſerved. All that can be gathered from him with regard to this is, that the different caſes abovementioned, when applied to the different parts of the body, produce a great variety of diſtempers. Some of thoſe diſtempers he accounted *mortal*, others *dangerous*, and the reſt eaſily *curable*, according to the cauſe from whence they ſpring and the parts on which they fall. In ſeveral places alſo he diſtinguiſhes diſeaſes from the time of their duration, into *acute* or *ſhort*, and *chronical* or *long*. He likewiſe diſtinguiſhes diſeaſes by the particular places where they prevail, whether ordinary or extraordinary. The firſt, that is, thoſe that are frequent and familiar to certain places, he called *endemic* diſeaſes; and the latter, which ravaged extraordinarily ſometimes in one place, ſometimes in another, which ſeized great numbers at certain times, he called *epidemic*, that is, *popular* diſeaſes; and of this kind the moſt terrible is the plague. He likewiſe mentions a third kind, the oppoſite of the former; and theſe he calls *ſporadic*, or ſtraggling diſeaſes, theſe laſt include all the different ſorts of diſtempers which invade at any one ſeaſon, which are ſometimes of one ſort and ſometimes of another. He diſtinguiſhed between thoſe diſeaſes which are hereditary, or born with us, and thoſe which are contracted afterwards; and likewiſe between thoſe of a *kindly* and ſuch as are of a *malignant* nature, the former of which are eaſily and frequently cured, but the latter give the phyſicians a great deal of trouble, and are ſeldom overcome by all their care.

10
His opinion of a criſis.

Hippocrates remarked four ſtages in diſtempers; viz. the beginning of the diſeaſe, its augmentation, its ſtate or height, and its declination. In ſuch diſeaſes as terminate fatally, death comes in place of the declination. In the third ſtage, therefore, the change is moſt conſiderable, as it determines the fate of the ſick perſon; and this is moſt commonly done by means of a *criſis*. By this word he underſtood any ſudden change in ſickneſs, whether for the better or for the worſe, whether health or death ſucceed immediately. Such a change, he ſays, is made at that time by *nature*, either abſolving or condemning the patient. Hence we may conclude, that Hippocrates imagined diſeaſes to be only a diſturbance of the animal economy, with which Nature was perpetually at variance, and uſing her utmoſt endeavours to expel the offending cauſe. Her manner of acting on theſe occaſions is to reduce to their natural ſtate thoſe humours whoſe diſcord occaſions the diſturbance of the whole body, whether in relation to their quantity, quality, mixture, motion, or any other way in which they become offenſive. The principal means employed by nature for this end is what Hippocrates calls *concoction*. By this he underſtood the bringing the morbific matter lodged in the humours to ſuch a ſtate, as to by eaſily fitted for expulſion by whatever means nature might think moſt proper. When matters are brought to this paſs, whatever is ſuperfluous or hurtful immediately empties itſelf, or nature points out to phyſicians the way by which ſuch an evacuation is to be accompliſhed. The criſis takes place either by bleeding, ſtool, vomit, ſweat, urine, tumors or abſceſſes, ſcabs, pimples, ſpots, &c. But theſe evacuations are not to be looked upon as the effects of a true criſis, unleſs they are in conſiderable quantity; ſmall diſcharges not being ſufficient to make a criſis. On the contrary, ſmall diſcharges are a ſign that nature is depreſſed by the load of humours, and that ſhe lets them go thro' weakneſs and continual irritation. What comes forth in this manner is crude, becauſe the diſtemper is yet too ſtrong; and while matters remain in this ſtate, nothing but a bad or imperfect criſis is to be expected. This ſhows that the diſtemper triumphs, or at leaſt is equal in ſtrength to nature, which prognoſticates death, or a prolongation of the diſeaſe. In this laſt caſe, however, nature often has an opportunity of attempting a new criſis more happy than the former, after having made freſh efforts to advance the concoction of the humours.—It muſt here be obſerved, however, that, according to Hippocrates, concoction cannot be made but in a certain time, as every fruit has a limited time to ripen; for he compares the humours which nature has digeſted to fruits come to maturity.

The time required for concoction depends on the differences among diſtempers mentioned above. In thoſe which Hippocrates calls *very acute*, the digeſtion or criſis happens by the fourth day, in thoſe which are only *acute*, it happens on the ſeventh, 11th, or 14th day; which laſt is the longeſt period generally allowed by Hippocrates in diſtempers that are truly acute; though in ſome places he ſtretches it to the 20th, or 21ſt, nay, ſometimes to the 40th or 60th days. All diſeaſes that exceed this laſt term are called *chronical*. And while in thoſe diſeaſes that exceed 14 days, he conſiders every fourth day as critical, or at leaſt remarkable, by which we may judge whether the criſis on the following fourth day will be favourable or not; ſo in thoſe which run from 20 to 40 he reckons only the ſevenths, and in thoſe that exceed 40 he begins to reckon by 20. Beyond the 120th he thinks that the number of days has no power over the criſis. They are then referred to the general changes of the ſeaſons; ſome terminating about the equinoxes; others about the ſolſtices; others about the riſing or ſetting of the ſtars of certain conſtellations; or if numbers have yet any place, he reckons by months, or even whole years. Thus (he ſays), certain diſeaſes in children have their criſis in the ſeventh month after their birth, and others in their ſeventh or even their 14th year.

Though Hippocrates mentions the 21ſt as one of the critical days in acute diſtempers, as already noticed; yet, in other places of his works, he mentions alſo the 20th. The reaſon he gives for this in one of thoſe places of his works is, that the days of ſickneſs were not quite entire. In general, however, he is much attached to the odd days: inſomuch that in one of his aphoriſms he tells us, "The ſweats that come out upon the 3d, 5th, 7th, 9th, 11th, 14th, 17th, 21ſt, 27th, 31ſt, or 34th days, are beneficial; but thoſe that come out upon other days ſignify that the ſick ſhall be brought low, that his diſeaſe ſhall be very tedious, and that he ſhall be ſubject to relapſes." He further ſays, "That the fever which leaves the ſick upon any but an odd day is uſually apt to relapſe." Sometimes, however, he confeſſes that it is otherwiſe; and he gives an inſtance of a ſalutary criſis happening on the ſixth day. But theſe are very rare inſtances, and therefore cannot, in his opinion, overthrow the general rule.

Beſides the criſis, however, or the change which determines the fate of the patient, Hippocrates often ſpeaks of another, which only changes the ſpecies of the diſtemper, without reſtoring the patient to health; as when a vertigo is turned to an epilepſy, a tertian fever to a quartan, or to a continued, &c.

11
His accuracy in prognoſtics;

But what has chiefly contributed to procure the vaſt reſpect generally paid to Hippocrates is his induſtry in obſerving the moſt minute circumſtances of diſeaſes, and his exactneſs in nicely deſcribing every thing that happened before, and every accident that appeared at the ſame time with them; and likewiſe what appeared to give eaſe, and what to increaſe the malady: which is what we call *writing the hiſtory of a diſeaſe*.—Thus he not only diſtinguiſhed one diſeaſe from another by the ſigns which properly belonged to each; but by comparing the ſame ſort of diſtemper which happened to ſeveral perſons, and the accidents which uſually appeared before and after, he could often foretel a diſeaſe before it came, and afterwards give a right judgment of the event of it. By this way of prognoſticating, he came to be exceedingly admired: and this he carried to ſuch a height, that it may be juſtly be ſaid to be his maſter-piece; and Celſus, who lived after him, remarks, that ſucceeding phyſicians, though they found out ſeveral new things relating to the management of diſeaſes, yet were obliged to the writings of Hippocrates for all that they knew of ſigns.

From the look;

The firſt thing Hippocrates conſidered, when called to a patient, was his looks.—It was a good ſign with him to have a viſage reſembling that of a perſon in health, and the ſame with what the ſick man had before he was attacked by the diſeaſe. As it varied from this, ſo much the greater danger was apprehended. The following is the deſcription which he gives of the looks of a dying man.—"When a patient (ſays he) has his noſe ſharp, his eyes ſunk, his temples hollow, his ears cold and contracted, the ſkin of his forehead tenſe and dry, and the colour of his face tending to a pale-green, or lead colour, one may give out for certain that death is very near at hand; unleſs the ſtrength of the patient has been exhauſted all at once by long watchings, or by a looſeneſs, or being a long time without eating." This obſervation has been confirmed by thoſe of ſucceeding phyſicians, who have, from him, denominated it the *Hippocratic face*. The lips hanging relaxed and cold, are likewiſe looked upon by this author as a confirmation of the foregoing prognoſtic. He took alſo his ſigns from the diſpoſition of the eyes in particular. When a patient cannot bear the light: when he ſheds tears involuntarily; when, in ſleeping, ſome part of the white of the eye is ſeen, unleſs he uſually ſleeps after that manner, or has a looſeneſs upon him: theſe ſigns, as well as the foregoing ones, prognoſticate danger. The eyes deadened, as it were with a miſt ſpread over them, or their brightneſs loſt, likewiſe preſages death, or great weakneſs. The eyes ſparkling, fierce, and fixed, denote the patient to be delirious, or that he ſoon will be ſeized with a frenzy. When the patient ſees any thing red, and like ſparks of fire and lightning paſs before his eyes, you may expect an hæmorrhagy; and this often happens before thoſe criſes which are to be attended by a loſs of blood.

From the poſture in bed;

The condition of the patient is alſo ſhown by his poſture in bed. If you find him lying on one ſide, his body, neck, legs, and arms, a little contracted, which is the poſture of a man in health, it is a good ſign: on the contrary, if he lies on his back, his arms ſtretched out, and his legs hanging down, it is a ſign of great weakneſs; and particularly when the patient ſlides or lets himſelf fall down towards the feet, it denotes the approach of death. When a patient in a burning fever is continually feeling about with his hands and fingers, and moves them up before his face and eyes as if he was going to take away ſomething that paſſed before them; or on his bed-covering, as if he was picking or ſearching for little ſtraws, or taking away ſome filth, or drawing out little flocks of wool; all this is a ſign that he is delirious, and that he will die. Among the other ſigns of a preſent or approaching delirium he alſo adds this: When a patient who naturally ſpeaks little begins to talk more than he uſed to do, or when one that talks much becomes ſilent, this change is to be reckoned a ſort of delirium, or is a ſign that the patient will ſoon fall into one. The frequent trembling or ſtarting of the tendons of the wriſt, preſage likewiſe a delirium. As to the different ſorts of delirium, Hippocrates is much more afraid of thoſe that run upon mournful ſubjects, than ſuch as are accompanied with mirth.

From reſpiration;

When a patient breathes faſt, and is oppreſſed, it is a ſign that he is in pain, and that the parts above the diaphragm are inflamed. Breathing long, or when the patient is a great while in taking his breath, ſhows him to be delirious; but eaſy and natural reſpiration is always a good ſign in acute diſeaſes. Hippocrates depended much on reſpiration in making his prognoſtics; and therefore has taken care in ſeveral places to deſcribe the different manner of a patient's breathing. Continual watchings in acute diſeaſes, are ſigns of preſent pain, or a delirium near at hand.

From excrementitious diſcharges.

Urine.

Hippocrates alſo drew ſigns from all excrements, whatever they are, that are ſeparated from the body of man. His moſt remarkable prognoſtics, however, were from the urine. The patient's urine, in his opinion, is beſt when the ſediment is white, ſoft to the touch, and of an equal conſiſtence. If it continue ſo during the courſe of the diſtemper, and till the time of the criſis, the patient is in no danger, and will ſoon be well. This is what Hippocrates called *concocted urine*, or what denotes the concoction of the humours; and he obſerved, that this concoction of the urine ſeldom appeared thoroughly, but on the days of the criſis which happily put an end to the diſtemper. "We ought (ſaid Hippocrates) to compare the urine with the purulent matter which runs from ulcers. As the pus, which is white, and of the ſame quality with the ſediment of the urine we are now ſpeaking of, is a ſign that the ulcer is on the point of cloſing; ſo that which is clear, and of another colour than white, and of an ill ſmell, is a ſign that the ulcer is virulent, and in the ſame manner difficult to be cured: the urines that are like this we have deſcribed are only thoſe which may be named good; all the reſt are ill, and differ from one another only in the degrees of more and leſs. The firſt never appear but when nature has overcome the diſeaſe; and are a ſign of the concoction of humours, without which you cannot hope for a certain cure. On the contrary, the laſt are made as long as the crudity remains, and the humours continue unconcocted. Among the urines of this laſt ſort, the beſt are reddiſh, with a ſediment that is ſoft, and of an equal conſiſtence; which denotes, that the diſeaſe will be ſomewhat tedious, but without danger. The worſt are thoſe which are very red, and at the ſame time clear and without ſediment; or that are muddy and troubled in the making. In urine there is often a ſort of cloud hanging in the veſſel in which it is received; the higher this riſes, or the farther diſtant it is from the bottom, or the more different from the colour of the laudable ſediment abovementioned, the more there is of crudity. That which is yellow, or of a ſandy colour, denotes abundance of bile; that which is black is the worſt, eſpecially if it has an ill ſmell, and is either altogether muddy or altogether clear. That whoſe ſediment is like large ground wheat or little flakes or ſcales ſpread one upon another, or bran, preſages ill, eſpecially the laſt. The fat or oil that ſometimes ſwims upon the top of the urine, and appears in a form ſomething like a ſpider's web, is a ſign

Hippocrates. of a conſumption of the fleſh and ſolid parts. The making of a great quantity of urine is the ſign of a criſis, and ſometimes the quality of it ſhows how the bladder is affected. We muſt alſo obſerve, that Hippocrates compared the ſtate of the tongue with the urine; that is to ſay, when the tongue was yellow, and charged with bile, the urine he knew muſt of courſe be of the ſame colour; and when the tongue was red and moiſt, the urine was of its natural colour.

Fæces. His prognoſtics for the excretions by ſtool are as follow. Thoſe that are ſoft, yellowiſh, of ſome conſiſtence, and not of an extraordinary ill ſmell, that anſwer to the quantity of what is taken inwardly, and that are voided at the uſual hours, are the beſt of all. They ought alſo to be of a thicker conſiſtence when the diſtemper is near the criſis; and it ought to be taken for a good prognoſtic, when ſome worms, round and long, are evacuated at the ſame time with them. The prognoſis, however, may ſtill be favourable, though the matter excreted be thin and liquid, provided it make not to much noiſe in coming out, and the evacuation be not in a ſmall quantity nor to often: nor in ſo great abundance, nor ſo often as to make the patient faint. All matter that is watery, white, of a pale green, or red, or frothy and viſcous, is bad. That which is blackiſh, or of a lived hue, is the moſt pernicious. That which is pure black, and nothing elſe but a diſcharge of black bile, always prognoſticates very ill; this humour, from what part ſoever it comes, ſhowing the ill diſpoſition of the inteſtines. The matter that is of ſeveral different colours, denotes the length of the diſtemper; and, at the ſame time, that it may be of dangerous conſequence. Hippocrates places in the ſame claſs the matter that is bilious or yellow, and mixed with blood, or green and black, or like the dregs or ſcrapings of the guts. The ſtools that conſiſt of pure bile, or entirely of phlegm, he alſo looks upon to be very bad.

Matter caſt up by vomiting ought to be mixed with bile and phlegm; where one of theſe humours only is obſerved, it is worſe. That which is black, livid, green, or of the colour of a leek, indicates alarming conſequences. The ſame is to be ſaid of that which ſmells very ill; and if at the ſame time it be livid, death is not far off. The vomiting of blood is very often mortal.

Expectoration. The ſpittings which give eaſe in diſeaſes of the lungs and in pleuriſies, are thoſe that come up readily and without difficulty; and it is good if they be mixed at the beginning with much yellow: but if they appear of the ſame colour, or are red, a great while after the beginning of the diſtemper, are ſalt and acrimonious, and cauſe violent coughings, they are not good. Spittings purely yellow are bad; and thoſe that are white, viſcous, and frothy, give no eaſe. Whiteneſs is a good ſign of concoction in regard to ſpittings; but they ought not at all to be viſcous, nor too thick, nor too clear. We may make the ſame judgment of the excrements of the noſe according to their concoction and crudity. Spittings that are black, green, and red, are of very bad conſequence. In inflammations of the lungs, thoſe that are mixed with bile and blood preſage well if they appear at the beginning, but are bad if they ariſe not about the ſeventh day. But the worſt ſign in theſe diſtempers is, when there is no expectoration at all, and the too great quantity of matter that is ready to be diſcharged this way makes a rattling in the breaſt. After ſpitting of blood, the diſcharge of purulent matter often follows, which brings on a conſumption, and at laſt death.

Sweats. A kind good ſweat is that which ariſes on the day of the criſis, and is diſcharged in abundance all over the body, and at the ſame time from all parts of the body, and thus carries off the fever: A cold ſweat is alarming, eſpecially in acute fevers, for in others it is only a ſign of long continuance. When the patient ſweats no where but on the head and neck, it is a ſign that the diſeaſe will be long and dangerous. A gentle ſweat in ſome particular part, of the head and breaſt, for inſtance, gives no relief, but denotes the ſeat of the diſtemper, or the weakneſs of the part. This kind of ſweat was called by Hippocrates *ephidroſis*.

The hypochondria, or the abdomen in general, ought always to be ſoft and even, as well on the right ſide as on the left. When there is any hardneſs or unevenneſs in thoſe parts, or heat and ſwellings, or when the patient cannot endure to have it touched, it is a ſign the inteſtines are indiſpoſed.

From the pulſe. Hippocrates alſo inquired into the ſtate of the pulſe, or the beating of the arteries. The moſt ancient phyſicians, however, and even Hippocrates himſelf, for a long time, by this word underſtood the violent pulſation that is felt in that inflamed part, without putting the fingers to it. It is obſerved by Galen, and other phyſicians, that Hippocrates touches on the ſubject of the pulſe more ſlightly than any other on which he treats. But that our celebrated phyſician underſtood ſomething even on this ſubject, is eaſily gathered from ſeveral paſſages in his writings; as when he obſerves, that in acute fevers the pulſe is very quick and very great; and when he makes mention, in the ſame place, of trembling pulſes, and thoſe that beat ſlowly; when he obſerves, that in ſome diſeaſes incident to women, when the pulſe ſtrikes the finger faintly, and in a languiſhing manner, it is a ſign of approaching death. He remarks alſo, in the *Coacæ Prænotiones*, that he whoſe vein, that is to ſay, whoſe artery of the elbow, beats, is juſt going to run mad, or elſe that the perſon is at that time very much under the influence of anger.

From this account of Hippocrates, it will appear, that he was not near ſo much taken up with reaſoning on the phenomena of diſeaſes, as with reporting them. He was content to obſerve theſe phenomena accurately, to diſtinguiſh diſeaſes by them, and judged of the event by comparing them exactly together. For his ſkill in prognoſtics he was indeed very remarkable, as we have already mentioned, inſomuch that he and his pupils were looked upon by the vulgar as prophets. What adds very much to his reputation is, that he lived in an age when phyſic was altogether buried in ſuperſtition, and yet he did not ſuffer himſelf to be carried away by it; on the contrary, on many occaſions, he expreſſes his abhorrence of it.

Having thus ſeen in what Hippocrates makes the difference between health and ſickneſs to conſiſt, and likewiſe the moſt remarkable ſigns from whence he drew his prognoſtics, we muſt now conſider the means he preſcribed for the preſervation of health, and the cure of diſeaſes. One of his principal maxims was this, That, to preſerve health, we ought not to overcharge ourſelves with too much eating, nor neglect the uſe of exercife and labour. In the next place, That we ought by no means to accuſtom ourſelves to too nice and exact a method of living; becauſe thoſe who have once begun to act by this rule, if they vary in the leaſt from it, find themſelves very ill; which does not happen to thoſe who take a little more liberty, and live ſomewhat more irregularly. Notwithſtanding this he does not not neglect to inquire diligently into what thoſe who were in health uſed for food in his time.

12 His maxims for the preſervation of health.

Diet.

Here we cannot help taking notice of the prodigious diſparity between the delicacy of the people in our days and in thoſe of Hippocrates: for he takes great pains to tell the difference between the fleſh of a dog, a fox, a horſe, and an aſs; which he would not have done if at that time they had not been uſed for victuals, at leaſt by the common people. Beſides theſe, however, Hippocrates ſpeaks of all other kinds of proviſion that are now in uſe; for example, ſalads, milk, whey, cheeſe, fleſh as well of birds as of four-footed beaſts, freſh and ſalt fiſh, eggs, all kinds of pulſe, and the different kinds of grain we feed on, as well as the different ſorts of bread that are made of it. He alſo ſpeaks very often of a ſort of liquid food, or broth, made of barley-meal, or ſome other grain, which they ſteeped for ſome time, and then boiled in water. With regard to drink, he takes a great deal of pains to diſtinguiſh the good waters from the bad. The beſt, in his opinion, ought to be clear, light, without ſmell or taſte, and taken out of the fountains that turn towards the eaſt. The ſalt-waters, thoſe that he calls hard, and thoſe that riſe out of fenny ground, are the worſt of all; he condemns alſo thoſe that come from melted ſnow. But though Hippocrates makes all thoſe diſtinctions, he adviſes thoſe who are in health to drink of the firſt water that comes in their way. He ſpeaks alſo of alum waters, and thoſe that are hot; but does not enlarge upon their qualities. He adviſes to mix wine with an equal quantity of water: and this (he ſays) is the juſt proportion; by uſing which the wine will expel what is hurtful to the body, and the water will ſerve to temper the acrimony of the humours.

Exerciſe.

For thoſe that are in health, and likewiſe for ſuch as are ſick, Hippocrates adviſes exerciſe. The books, however, which treat on this ſubject, M. Le Clerk conjectures to have been written by Herodicus, who firſt introduced gymnaſtic exerciſe into medicine, and who is ſaid by Hippocrates himſelf to have killed ſeveral people by forcing them to walk while they were afflicted with fevers and other inflammatory diſorders. The advices given in them conſiſt moſtly in directions for the times in which we ought to walk, and the condition we ought to be in before it; when we ought to walk ſlowly, and when to run, &c.; and all this with reſpect to different ages and temperaments, and with deſign to bring the body down, or diſſipate the humours. Wreſtling, although a violent exerciſe, is numbered with the reſt. In the ſame place alſo mention is made of a play of the hands and fingers, which was thought good for health, and called *chironomia*; and of another diverſion which was performed round a ſort of ball hung up, which they called *corycus*, and which they ſtruck forward with both their hands.

Excretions.

With regard to theſe things which ought to be ſeparated from, or retained in the human boby, Hippocrates obſerves, that people ought to take great care not to load themſelves with excrements, or keep them in too long; and beſides the exerciſe abovementioned, which carries off one part of them, and which he preſcribed chiefly on this account, he adviſes people to excite and rouſe up nature when ſhe flagged, and did not endeavour to expel the reſt, or take care of the impediments by which ſhe was reſiſted. For this reaſon he preſcribed meats proper for looſening the belly; and when theſe were not ſufficient, he directed the uſe of clyſters and ſuppoſitories. For thin and emaciated perſons he directed clyſters compoſed only of milk and oily unctuous ſubſtances which they mixed with a decoction of chick-peaſe; but for ſuch as were plethoric, they only made uſe of ſalt or ſea-water.

As preſervative againſt diſtempers, Hippocrates alſo adviſed the uſe of vomits, which he directed to be taken once or twice a month during the time of winter and ſpring. The moſt ſimple of theſe were made of a decoction of hyſop, with an addition of a little vinegar and ſalt. He made thoſe that were of a ſtrong and vigorous conſtitution take this liquor in a morning faſting; but ſuch as were thin and weakly took it after ſupper.—Venery, in his opinion, is wholeſome, provided people conſult their ſtrength, and do not purſue it to exceſs; which he finds fault with on all occaſions, and would have exceſs avoided alſo in relation to ſleep and watching. In his writings are likewiſe to be found ſeveral remarks concerning good and bad air; and he makes it appear that the good or bad diſpoſition of this element does not depend ſolely on the difference of the climate, but on the ſituation of every place in particular. He ſpeaks alſo of the good and bad effects of the paſſions, and recommends moderation in regard to them.

From what we have already related concerning the opinions of Hippocrates, it may naturally be concluded, that for the moſt part he would be contented with obſerving what the ſtrength of nature is able to accompliſh without being aſſiſted by the phyſician. That this was really the caſe, may be eaſily perceived from a peruſal of his books entitled, "Of epidemical diſtempers;" which are, as it were, journals of the practice of Hippocrates; for there were find him often doing nothing more than deſcribing the ſymptoms of a diſtemper, and informing us what has happened to the patient day after day, even to his death or recovery, without ſpeaking a word of any kind of remedy. Sometimes, however, he did indeed make uſe of remedies; but theſe were exceedingly ſimple and few, in compariſon of what have been given by ſucceeding practitioners. Theſe remedies we ſhall preſently conſider after we have given an abridgment of the principal maxims on which his practice is founded.

13 His maxims for the cure of diſeaſe.

Hippocrates aſſerted in the firſt place, That contraries, or oppoſites, are the remedies for each other; and this maxim he explains by an aphoriſm; in which he ſays, that evacuations cure thoſe diſtempers which come from repletion, and repletion thoſe that are cauſed

ſed by evacuation. So heat is deſtroyed by cold, and cold by heat, &c. In the ſecond place, he aſſerted, that phyſic is an addition of what is wanting, and a ſubtraction or retrenchment of what is ſuperfluous: an axiom which is explained by this, viz. that there are ſome juices or humours, which in particular caſes ought to be evacuated, or driven out of the body, or dried up; and ſome others which ought to be reſtored to the body, or cauſed to be produced there again. As to the method to be taken for this addition or retrenchment, he gives this general caution, That you ought to be careful how you fill up, or evacuate, all at once, or too quickly, or too much; and that it is equally dangerous to heat or cool again on a ſudden; or rather, you ought not to do it: every thing that runs to an exceſs being an enemy to nature. In the fourth place, Hippocrates allowed that we ought ſometimes to dilate, and ſometimes to lock up: to dilate, or open the paſſages by which the humours are voided naturally, when they are not ſufficiently opened, or when they are cloſed; and, on the contrary, to lock up or ſtraiten the paſſages that are relaxed, when the juices that paſs there ought not to paſs, or when they paſs in too great quantity. He adds, that we ought ſometimes to ſmooth, and ſometimes to make rough: ſometimes to harden, and ſometimes to ſoften again; ſometimes to make more fine or ſupple; ſometimes to thicken; ſometimes to rouſe up, and at other times to ſtupify or take away the ſenſe; all in relation to the ſolid parts of the body, or to the humours. He gives alſo this farther leſſon, That we ought to have regard to the courſe the humours take, from whence they come, and whither they go; and in conſequence of that, when they go where they ought not, that we make them take a turn about, or carry them another way, almoſt like the turning the courſe of a river: or, upon other occaſions, that we endeavour if poſſible to recal, or make the ſame humours return back again; drawing upward ſuch as have a tendency downward, and drawing downward ſuch as tend upward. We ought alſo to carry off, by convenient ways, that which is neceſſary to be carried off; and not let the humours once evacuated enter into the veſſels again. Hippocrates gives alſo the following inſtruction, That when we do any thing according to reaſon, though the ſucceſs be not anſwerable, we ought not too eaſily, or too haſtily, to alter the manner of acting, as long as the reaſons for it are yet good. But as this maxim might ſometimes prove deceitful, he gives the following as a corrector to it: "We ought (ſays he) to mind with a great deal of attention what gives eaſe, and what creates pain; what is eaſily ſupported, and what cannot be endured." We ought not to do any thing raſhly; but ought often to pauſe, or wait, without doing any thing: by this way, if you do the patient no good, you will at leaſt do him no hurt.

Theſe are the principal and moſt general maxims of the practice of Hippocrates, and which proceed upon the ſuppoſition laid down at the beginning, viz. that nature cures diſeaſes. We next proceed to conſider particularly the remedies employed by him, which will ſerve to give us further inſtructions concerning his practice.

14
His maxims reſpecting diet.

Diet was the firſt, the principal, and often the only remedy made uſe of by this great phyſician to anſwer the greateſt part of the intentions abovementioned: by means of it he oppoſed moiſt to dry, hot to cold, &c.; and what he looked upon to be the moſt conſiderable point was, that thus he ſupported nature, and aſſiſted her to overcome the malady. The dietetic part of medicine was ſo much the invention of Hippocrates himſelf, that he was very deſirous to be accounted the author of it; and the better to make it appear that it was a new remedy in his days, he ſays expreſsly, that the ancients had wrote almoſt nothing concerning the diet of the ſick, having omitted this point, though it was one of the moſt eſſential parts of the art.

15
Diet in acute diſeaſes.

The diet preſcribed by Hippocrates for patients labouring under acute diſtempers, differed from that which he ordered for thoſe afflicted with chronical ones. In the former, which require a more particular exactneſs in relation to diet, he preferred liquid food to that which was ſolid, eſpecially in fevers. For theſe he uſed a ſort of broth made of cleanſed barley; and to this he gave the name of *ptiſan*. The manner in which the ancients prepared a ptiſan was as follows: They firſt ſteeped the barley in water till it was plumped up; and afterwards they dried it in the ſun, and beat it to take off the huſk. They next ground it; and having let the flour boil a long time in the water, they put it out into the ſun, and when it was dry they preſſed it cloſe. It is properly this flour ſo prepared that is called *ptiſan*. They did almoſt the ſame thing with wheat, rice, lentils, and other grain: but they gave theſe ptiſans the name of the grain from whence they were extracted, as *ptiſan of lentils*, *rice*, &c. whereas the ptiſan of barley was called ſimply *ptiſan*, on account of the excellency of it. When they wanted to uſe it, they boiled one part of it in 10 or 15 of water; and when it began to grow plump in boiling, they added a little vinegar, and a very ſmall quantity of aniſe or leek, to keep it from clogging or filling the ſtomach with wind. Hippocrates preſcribes this broth for women that have pains in their belly after delivery. "Boil ſome of this ptiſan (ſays he), with ſome leek, and the fat of a goat, and give it to the woman in bed." This will not be thought very ſingular, if we reflect on what has been hinted above concerning the indelicate manner of living in thoſe times. He preferred the ptiſan to all other food in fevers, becauſe it ſoftened and moiſtened much, and was beſides of eaſy digeſtion. If he was concerned in a continual fever, he would have the patient begin with a ptiſan of a pretty thick conſiſtence, and go on by little and little, leſſening the quantity of barley-flour as the height of the diſtemper approached; ſo that he did not feed the patient but with what he called the *juice of the ptiſan*; that is, the ptiſan ſtrained, where there was but very little of the flour remaining, in order that nature being diſcharged in part from the care of digeſting the aliments, ſhe might the more eaſily hold out to the end, and overcome the diſtemper, or the cauſe of it. With regard to the quantity, he cauſed the ptiſan to be taken twice a-day by ſuch patients as in health uſed to take two meals a-day, not thinking it convenient that thoſe who were ſick would eat oftener than when they were well. He alſo would not allow eating twice a-day to thoſe who eat but once in that time when in health. In the paroxyſm of a fever he gave nothing at all; and in all diſtempers where there are exacerbations, he forbid nouriſhment while the exacerbations continued. He let children eat more; but thoſe who were grown up to man's eſtate, or were of an advanced age, leſs; making allowance, however, for the cuſtom of each particular perſon, or for that of the country.

But though he was of opinion that too much food ought not to be allowed to the ſick, he was not of the mind of ſome phyſicians who preſcribed long abſtinence, eſpecially in the beginning of fevers. The reaſon he gave for this was, that the contrary practice weakened the patients too much during the firſt days of the diſtemper, by which means their phyſicians were obliged to allow them more food when the illneſs was at its height, which in his opinion was improper. Beſides, in acute diſtempers, and particularly in fevers, Hippocrates made choice of refreſhing and moiſtening nouriſhment; and amongſt other things preſcribed orange, melon, ſpinach, gourd, and dock. This ſort of food he gave to thoſe that were in a condition to eat, or could take ſomething more than a ptiſan.

Drink.

The drink he commonly gave to his patients was made of eight parts of water and one of honey. In ſome diſtempers they added a little vinegar; but beſides theſe, they had another ſort named κυκεων, or *mixture*. One preſcription of this ſort we find intended for a conſumptive perſon; it conſiſted of rue, aniſe, celery, coriander, juice of pomegranate, the roughest red wine, water, flour of wheat and barley, with old cheeſe made of goats milk. Hippocrates did not approve of giving plain water to the ſick; but though he generally preſcribed the drinks abovementioned, he did not abſolutely forbid the uſe of wine, even in acute diſtempers and fevers, provided the patients were not delirious nor had pains in their head. Beſides, he took care to diſtinguiſh the wines proper in theſe caſes: preferring to all other ſorts white wine that is clear and has a great deal of water, with neither ſweetneſs nor flavour.

16
Diet in chronic diſeaſes.

Theſe are the moſt remarkable particulars concerning the diet preſcribed by Hippocrates in acute diſtempers; in chronical ones he made very much uſe of milk and whey; though we are not certain whether this was done on account of the nouriſhment expected from them, or that he accounted them medicines.

17
His maxims reſpecting bathing.

There were many diſeaſes for which he judged the bath was a proper remedy; and he takes notice of all the circumſtances that are neceſſary in order to cauſe the patient receive benefit from it, among which the following are the principal. The patient that bathes himſelf muſt remain ſtill and quiet in his place without ſpeaking while the aſſiſtants throw water over his head or are wiping him dry; for which laſt purpoſe he deſired them to keep ſponges, inſtead of that inſtrument called by the ancients *ſtrigil*, which ſerved to rub off from the ſkin the dirt and naſtineſs left upon it by unguents and oils with which they anointed themſelves. He muſt alſo take care not to catch cold; and muſt not bathe immediately after eating and drinking, nor eat or drink immediately after coming out of the bath. Regard muſt alſo be had whether the patient has been accuſtomed to bathe while in health, and whether he has been benefited or hurt by it. Laſtly, he muſt abſtain from the bath when the body is too open, or too coſtive, or when he is too weak; or if he has an inclination to vomit, a great loſs of appetite, or bleeds at the noſe. The advantage of the bath, according to Hippocrates, conſiſts in moiſtening and refreſhing, taking away wearineſs, making the ſkin ſoft and the joints pliant; in provoking urine, making the noſtrils open, and opening the other excretories. He allows two baths in a day to thoſe who have been accuſtomed to it in health.

18
His maxims reſpecting exerciſe.

In chronical diſtempers Hippocrates approved very much of exerciſe, though he did not allow it in acute ones: but even in theſe he did not think that a patient ought always to lie a-bed; but tells us, that "we muſt ſometimes puſh the timorous out of bed, and rouſe up the lazy."

19
His maxims reſpecting purgation.

When he found that diet and exerciſe were not ſufficient to eaſe nature of a burden of corrupted humours, he was obliged to make uſe of other means, of which *purgation* was one. By this word he underſtood all the contrivances that are made uſe of to diſcharge the ſtomach and bowels; though it commonly ſignifies only the evacuation by the belly by ſtool. This evacuation he imagined to be occaſioned by the purgative medicines attracting the humours to themſelves. When firſt taken into the body, he thought they attracted that humour which was moſt ſimilar to them, and then the others, one after another.—Moſt of the purgatives uſed in his time were emetics alſo, or at leaſt were very violent in their operation downwards. Theſe were the white and black hellebore; the firſt of which is now reckoned among the poiſons. He cauſed alſo the Cnidian berries, which are nothing elſe but the ſeeds of thymelea or chamælea; cneorum peplium, which is a ſort of milk-thiſtle; thapſia; the juice of hippophaë, a ſort of rhamnus; elaterium, or juice of the wild cucumber; flowers of braſs, coloquintida, ſcammony, the magneſian ſtone, &c.

As theſe purgatives were all very ſtrong, Hippocrates was extremely cautious in their exhibition. He did not preſcribe them in the dog-days; nor did he ever purge women with child, and very ſeldom children or old people. He principally uſed purgatives in chronical diſtempers: but was much more wary in acute ones. In his books entitled "Of Epidemical Diſtempers," there are very few patients mentioned to whom he gave purgative medicines. He alſo takes notice expreſsly, that theſe medicines having been given in caſes of the diſtempers of which he was treating, had produced very bad effects. We are not, however, from this to conclude, that Hippocrates abſolutely condemned purging in acute diſtempers; for in ſome places he expreſsly mentions his having given them with ſucceſs. He was of opinion, for inſtance, that purging was good in a pleuriſy when the pain was ſeated below the diaphragm; and in this caſe he gave black hellebore, or ſome peplium mixed with the juice of *laſerpitium*, which is ſuppoſed to have been our aſafætida.

The principal rule Hippocrates gives with relation to purging is, that we ought only to purge off the humours that are concocted, and not thoſe that are yet crude, taking particular care not to do it at the beginning of the diſtemper, leaſt the humours ſhould be diſturbed or ſtirred up, which happens pretty often. He was not, however, the firſt who remarked that it would be of ill conſequence to ſtir the humours in the beginning of an acute diſtemper. The Egyptian phyſicians had before obſerved the ſame thing. By the *beginning* of a diſtemper, Hippocrates underſtood all the time from the firſt day to the fourth complete.

Hippocrates imagined that each purgative medicine was adapted to the carrying off ſome particular humour; and hence the diſtinction of purgatives into hydragogue, cholagogue, &c. which is now juſtly exploded. In conſequence of this notion, which prevailed long after his time, he pretended that we knew if a purgative had drawn from the body what was fit to be evacuated according as we found ourſelves well or ill upon it. If we found ourſelves well, it was a ſign that the medicine had effectually expelled the offending humour. On the contray, if we were ill, he imagined, whatever, quantity of humour came away, that the humour which cauſed the illneſs ſtill remained; not judging of the goodneſs or badneſs of a purge by the quantity of matters that were voided by it, but by their quality and the effect that followed after it.

Vomits were alſo pretty much uſed as medicines by Hippocrates. We have already ſeen what thoſe were which he preſcribed to people in health by way of preventatives. With regard to the ſick, he ſometimes adviſed them to the ſame, when his intentions were only to cleanſe the ſtomach. But when he had a mind to recal the humours, as he termed it, from the inmoſt receſſes of the body, he made uſe of briſker remedies. Among theſe was white hellebore; and this indeed he moſt frequently uſed to excite vomiting. He gave this root particularly to melancholy and mad people; and from the great uſe made of it in theſe caſes by Hippocrates and other ancient phyſicians, the phraſe *to have need of hellebore*, became a proverbial expreſſion for being out of one's ſenſes. He gave it alſo in defluxions, which come, according to him, from the brain, and throw themſelves on the noſtrils or ears, or fill the mouth with ſaliva, or that cauſe ſtubborn pains in the head, and a wearineſs or an extraordinary heavineſs, or a weakneſs of the knees, or a ſwelling all over the body. He gave it to conſumptive perſons in broth of lentils, to ſuch as were afflicted with the dropſy called *leucophlegmatia*, and in other chronical diſorders. But we do not find that he made uſe of it in acute diſtempers, except in the cholera morbus, where he ſays he preſcribed it with benefit. Some took this medicine faſting; but moſt took it after ſupper, as was commonly practiſed with regard to vomits taken by way of preſervation. The reaſon why he gave this medicine moſt commonly after eating was, that by mixing with the aliments, its acrimony might be ſomewhat abated, and it might operate with leſs violence on the membranes of the ſtomach. With the ſame intention alſo he ſometimes gave a plant called *ſeſamiodes*, and ſometimes mixed it with hellebore. Laſtly, in certain caſes he gave what he called *ſoft* or *ſweet* hellebore. This term had ſome relation to the quality of the hellebore, or perhaps to the quantity he gave of it.

When Hippocrates intended only to keep the body open, or evacuate the contents of the inteſtines, he made uſe of ſimples; as for example, the herb mercury, or cabbage; the juice or decoction of which he ordered to be drank. For the ſame purpoſe he uſed whey, and alſo cows and aſſes milk; adding a little ſalt to it, and ſometimes letting it boil a little. If he gave aſſes milk alone, he cauſed a great quantity of it to be taken, ſo that it muſt of neceſſity looſen the body. In one place he preſcribes no leſs than nine pounds of it to be taken as a laxative, but does not ſpecify the time in which it was to be taken. With the ſame intention he made uſe of ſuppoſitories and clyſters. The former were compounded of honey, the juice of the herb mercury, of nitre, powder of colocynth, and other ſharp ingredients, to irritate the anus. Theſe they formed into a ball, or into a long cylindrical maſs like a finger. The clyſters he made uſe of for ſick people were ſometimes the ſame with thoſe already mentioned as preventatives for people in health. At other times he mixed the decoction of herbs with nitre, honey, and oil, or other ingredients, according as he imagined he could by that means attract, waſh, irritate, or ſoften. The quantity of liquor he ordered was about 36 ounces; from which it was probable he did not intend that it ſhould all be uſed at one time.

On ſome occaſions Hippocrates propoſed to purge the head alone. This practice he employed, after purging the reſt of the body, in an apoplexy, inveterate pains of the head, a certain ſort of jaundice, a conſumption, and the greateſt part of chronical diſtempers. For that purpoſe he made uſe of the juices of ſeveral plants, as celery; to which he ſometimes added aromatic drugs, making the patients ſnuff up this mixture into their noſtrils. He uſed alſo powders compounded of myrrh, the flowers of braſs, and white hellebore, which he cauſed them put up into the noſe, to make them ſneeze, and to draw the phlegm from the brain. For the ſame purpoſe alſo he uſed what he calls *tetragonon*, that is, "ſomething having four angles;" but what this was, is now altogether unknown, and was ſo even in the days of Galen. The latter phyſician, however, conjectures it to be antimony, or certain flakes found in it.

In the diſtemper called *empyema* (or a collection of matter in the breaſt), he made uſe of a very rough medicine. He commanded the patient to draw in his tongue as much as he was able; and when that was done, he endeavoured to put into the hollow of the lungs a liquor that irritated the part, which, raiſing a violent cough, forced the lungs to diſcharge the purulent matter contained in them. The materials that he uſed for this purpoſe were of different ſorts; ſometimes he took the root of arum, which he ordered to be boiled with a little ſalt, in a ſufficient quantity of water and oil; diſſolving a little honey in it. At other times, when he intended to purge more ſtrongly, he took the flowers of copper and hellebore; after that he ſhook the patient violently by the ſhoulders, the better to looſen the pus. This remedy, according to Galen, he received from the Cnidian phyſicians; and it has never been uſed by the ſucceeding ones, probably becauſe the patients could not ſuffer it.

20
His maxims reſpecting blood-letting.

Blood-letting was another method of evacuation pretty much uſed by Hippocrates. Another aim he had in this, beſides the mere evacuation, was to divert or to recall the courſe of the blood when he imagined it was going where it ought not. A third end of bleeding was to procure a free motion of the blood and ſpirits,

rits, as we may gather from the following paſſage: "When any one becomes ſpeechleſs of a ſudden (ſays he), it is cauſed by the ſhutting of the veins, eſpecially when it happens to perſons otherwiſe in good health, without any outward violence. In this caſe the inward vein of the right-arm muſt be opened, and more or leſs blood taken away, according to the age or conſtitution of the patient. Thoſe that loſe their ſpeech thus have great fluſhings in their face, their eyes are ſtiff, their arms are diſtended, their teeth gnaſh, they have palpitations of the arteries, cannot open their jaws, the extremities are cold, and the ſpirits are intercepted in the veins. If pain enſues, it is by the acceſſion of the black bile and ſharp humours. For the internal parts being vellicated or irritated by theſe humours, ſuffer very much; and the veins, being alſo irritated and dried, diſtend themſelves extraordinarily, and are inflamed, and draw all that can flow to them; ſo that the blood corrupting, and the ſpirits not being able to paſs through the blood by their ordinary paſſages, the parts grow cold by reaſon of this ſtagnation of the ſpirits. Hence come giddineſs, loſs of ſpeech, and convulſions, if this diſorder reaches to the heart, the liver, or to the great veins. From hence ariſe alſo epilepſies and palſies, if the defluctions fall upon the parts laſt mentioned; and that they dry up, becauſe the ſpirits are denied a paſſage through them. In this caſe, after fomentation, a vein muſt be opened, while the ſpirits and humours are yet ſuſpended and unſettled."

Hippocrates had alſo a fourth intention for bleeding, and this was refreſhment. So in the iliac paſſion, he ordered bleeding in the arm and in the head; to the end, ſays he, that the ſuperior venter, or the breaſt, may ceaſe to be overheated. With regard to this evacuation, his conduct was much the ſame as to purging, in reſpect of time and perſons. We ought, ſays he, to let blood in acute diſeaſes, when they are violent, if the party be luſty and in the flower of his age. We ought alſo to have regard to the time, both in reſpect to the diſeaſe and to the ſeaſon in which we let blood. He alſo informs us, that blood ought to be let in great pains, and particularly in inflammations. Among theſe he reckons ſuch as fall upon the principal viſcera, as the liver, lungs, and ſpleen, as alſo the quinſey and pleuriſy, if the pain of the latter be above the diaphragm. In thoſe caſes he would have the patients blooded till they faint, eſpecially if the pain be very acute; or rather he adviſes that the orifice ſhould not be cloſed till the colour of the blood alters, ſo that from livid it turn red, or from red livid. In a quinſey he bleeded in both arms at once. Difficulty of breathing he alſo reckons among the diſtempers that require bleeding; and he mentions another ſort of inflammation of the lungs, which he calls a ſwelling or tumor of the lungs ariſing from heat; in which caſe he adviſes to bleed in all parts of the body; and directs particularly to the arms, tongue, and noſtrils. To make bleeding the more uſeful in all pains, he directed to open the vein neareſt the part affected; in a pleuriſy he directs to take blood from the arm of the ſide affected; and for the ſame reaſon, in pains of the head, he directs the veins of the noſe and forehead to be opened. When the pain was not urgent, and bleeding was adviſed by way of prevention, he directed the blood to be taken from the parts fartheſt off, with a deſign to divert the blood inſenſibly from the ſeat of pain. The higheſt burning fevers, which ſhow neither ſigns of inflammation nor pain, he does not rank among thoſe diſtempers that require bleeding. On the contrary, he maintains that a fever itſelf is in ſome caſes a reaſon againſt bleeding. If any one, ſays he, has an ulcer in the head, he muſt bleed, *unleſs he has a fever.* He ſays further, thoſe that loſe their ſpeech of a ſudden muſt be blooded, unleſs they have a fever. Perhaps he was afraid of bleeding in fevers, becauſe he ſuppoſed that they were produced by the bile and pituita, which grew hot, and afterwards heated the whole body, which is, ſays he, what we call *fever*, and which, in his opinion, cannot well be evacuated by bleeding. In other places alſo he looks upon the preſence or abundance of bile to be an objection to bleeding; and he orders to forbear veneſection even in a pleuriſy, if there be bile. To this we muſt add, that Hippocrates diſtinguiſhed very particularly between a fever which followed no other diſtemper, but was itſelf the original malady, and a fever which came upon inflammation. In the early ages of phyſic, the firſt were only properly called *fevers*: the others took their names from the parts affected; as *pleuriſy*, *peripneumony*, *hepatitis*, *nephritis*, &c. which names ſignify that the pleura, the lungs, the liver, or the kidneys, are diſeaſed, but do not intimate the fever which accompanies the diſeaſe. In this latter ſort of fever Hippocrates conſtantly ordered bleeding, but not in the former. Hence in his books Of Epidemic Diſtempers, we find but few directions for bleeding in the acute diſtempers, and particularly in the great number of continual and burning fevers there treated of. In the firſt and third book we find but one ſingle inſtance of bleeding, and that in a pleuriſy; in which, too, he ſtaid till the eighth day of the diſtemper. Galen, however, and moſt other commentators on Hippocrates, are of opinion that he generally blooded his patients plentifully in the beginning of acute diſorders, though he takes no notice of it in his writings. But had this been the caſe, he would not perhaps have had the opportunity of ſeeing ſo many fevers terminate by criſes, or natural evacuations, which happen of themſelves on certain days. Hippocrates, in fact, laid ſo much weight upon the aſſiſtance of nature and the method of diet, which was his favourite medicine, that he thought if they took care to diet the patients before mentioned, according to rule, they might leave the reſt to nature. Theſe are his principles, from which he never deviates; ſo that his pieces Of Epidemical Diſeaſes ſeem to have been compoſed only with an intention to leave to poſterity an exact model of management in purſuance of theſe principles.

With regard to the rules laid down by Hippocrates for bleeding, we muſt further take notice, that in all diſeaſes which had their ſeat above the liver, he blooded in the arm, or in ſome of the upper parts of the body; but for thoſe that were ſituated below it he opened the veins of the foot, ankle, or ham. If the belly was too laxative, and bleeding was at the ſame time thought neceſſary, he ordered the looſeneſs to be ſtopped before bleeding.

Almoſt all theſe inſtances, however, regard ſcarce any thing but acute diſtempers; but we find ſeveral concerning chronical diſeaſes. "A young man complained of great pain in his belly, with a rumbling while he was faſting, which ceaſed after eating: this pain and rumbling continuing, his meat did him no good; but, on the contrary, he daily waſted and grew lean. Several medicines, as well purges as vomits, were given him in vain. At length it was reſolved to bleed him by intervals, firſt in one arm and then in the other, till he had ſcarce any blood left, and by this method he was perfectly cured."

Hippocrates let blood alſo in a dropſy, even in a tympany; and in both caſes he preſcribes bleeding in the arm. In a diſeaſe occaſioned by an overgrown ſpleen, he propoſes bleeding ſeveral times repeated at a vein of the arm which he calls the *ſplenetic;* and in a kind of jaundice, he propoſes bleeding under the tongue. On ſome occaſions he took away great quantities of blood, as appears from what we have already obſerved. Sometimes he continued the blooding till the patient fainted: at other times he would blood in both arms at once; at others, he did it in ſeveral places of the body, and at ſeveral times. The veins he opened were thoſe of the arm, the hands, the ankles on both ſides, the hams, the forehead, behind the head, the tongue, the noſe, behind the ears, under the breaſts, and thoſe of the arms; beſides which, he burnt others, and opened ſeveral arteries. He likewiſe uſed cupping-veſſels, with intent to recal or withdraw the humours which fell upon any part. Sometimes he contented himſelf with the bare attraction made by the cupping-veſſels, but ſometimes alſo he made ſcarifications.

21 His maxims reſpecting diuretics and ſudorifics. When bleeding and purging, which were the principal and moſt general means uſed by Hippocrates for taking off a plethora, proved inſufficient for that purpoſe, he had recourſe to diuretics and ſudorifics. The former were of different ſorts, according to the conſtitution of the perſons: ſometimes baths, and ſometimes ſweet wine, were employed to provoke urine; ſometimes the nouriſhment which we take contributes to it: and amongſt thoſe herbs which are commonly eaten, Hippocrates recommends garlic, leeks, onions, cucumbers, melons, gourds, fennel and all other things which have a biting taſte and a ſtrong ſmell. With theſe he numbers honey, mixed with water or vinegar, and all ſalt meats. But, on ſome occaſions, he took four cantharides, and pulling off their wings and feet, gave them in wine and honey. Theſe remedies were given in a great number of chronical diſtempers after purging, when he thought the blood was overcharged with a ſort of moiſture which he calls *ichor;* or in ſuppreſſions of urine, and when it was made in leſs quantity than it ought. There were alſo ſome caſes in which he would force ſweat as well as urine; but he neither mentions the diſeaſes in which ſudorifics are proper, nor lets us know what medicines are to be uſed for this purpoſe, except in one ſingle paſſage, where he mentions ſweating, by pouring upon the head a great quantity of water till the feet ſweat; that is, till the ſweat diffuſes itſelf over the whole body, running from head to foot. After this he would have them eat boiled meat, and drink pure wine, and being well covered with clothes, lay themſelves down to reſt. The diſeaſe for which he propoſes the abovementioned remedy is a fever; which is not, according to him, produced by bile or pituita, but by mere laſſitude, or ſome other ſimilar cauſe; from whence we may conclude that he did not approve of ſweating in any other kind of fever.

Other remedies which Hippocrates tells us he made uſe of were theſe that purged neither bile nor phlegm, but act by cooling, drying, heating, moiſting, or by cloſing and thickning, reſolving and diſſipating. Theſe medicines, however, he does not particularly mention; and it is probable they were only ſome particular kinds of food. To theſe he joined *hypnotics*, or ſuch things as produce ſleep; but theſe laſt were uſed very ſeldom, and, it is moſt probable, were only different preparations of poppies.

22 The uſe he made of ſpecifics. Laſtly, beſides the medicines already mentioned, which acted in a ſenſible manner, Hippocrates made uſe of others called *ſpecifics*; whoſe action he did not underſtand, and for the uſe of which he could give no reaſon beſides his own experience, or that of other phyſicians. Theſe he had learned from his predeceſſors the deſcendants of Æſculapius, who, being *empirics*, did not trouble themſelves about inquiring into the operation of their remedies, provided their patients were cured.

23 His external applications. Of the external remedies preſcribed by Hippocrates, fomentations were the chief. Theſe were of two kinds. The one was a ſort of bath, in which the patient ſat in a veſſel full of a decoction of ſimples appropriated to his malady; ſo that the part effected was ſoaked in the decoction. This was chiefly uſed in diſtempers of the womb, of the arms, the bladder, the reins, and generally all the parts below the diaphragm. 24 Fomentations. The ſecond way of fomenting was, to take warm water and put it into a ſkin or a bladder, or even into a copper or earthen veſſel, and to apply it to the part affected; as, for example, in a pleuriſy. They uſed likewiſe a large ſponge, which they dipped in the water, or other hot liquor, and ſqueezed out part of the liquor before they applied it. The ſame uſe they made of barley, vetches, or bran, which were boiled in ſome proper liquor, and applied in a linen bag. Theſe are called *moiſt* fomentations. The dry ones were made of ſalt or millet, heated conſiderably, and applied to the part. Another kind of fomentation was the vapour of ſome hot liquor; an inſtance of which we find in his firſt book of Womens Diſtempers. He caſt, at ſeveral times, bits of red-hot iron into urine, and, covering up the patient cloſe, cauſed her to receive the ſteam below. His deſign in theſe kinds of fomentations was to warm the part, to reſolve or diſſipate, and draw out the peccant matter, to mollify and aſſuage pain, to open the paſſages, or even to ſhut them, according as the fomentations were emollient or aſtringent.

25 Fumigations. Fumigations were likewiſe very often uſed by Hippocrates. In the quinſey, he burned hyſſop with ſulphur and pitch, and cauſed the ſmoke to be drawn into the throat by a funnel; and by this means he brought away abundance of phlegm through the mouth and through the noſe. For this purpoſe he took nitre, marjoram, and creſs-ſeeds, which he boiled in water, vinegar, and oil, and, while it was on the fire, cauſed the patient to draw in the ſteam by a pipe. In his works we find a great number of fumigants for the diſtempers of women, to promote the menſtrual

Hippocrates.

flux, to check it, to help conception, and to eaſe pains in the matrix, or the ſuffocation of it. On theſe occaſions he uſed ſuch aromatics as were then known, viz cinnamon, caſſia, myrrh, and ſeveral odoriferous plants; likewiſe ſome minerals, ſuch as nitre, ſulphur, and pitch, and cauſed them to receive the vapours through a funnel into the uterus.

26 Gargles.

Gargles, a kind of fomentations for the mouth, were alſo known to Hippocrates. In the quinſey he uſed a gargle made of marjoram, ſavory, celery, mint and nitre, boiled with water and a little vinegar. When this was ſtrained, they added honey to it, and waſhed their mouths frequently with it.

27 Oils and ointments

Oils and ointments were likewiſe much uſed by Hippocrates, with a view to mollify and abate pain, to ripen boils, reſolve tumors, refreſh after wearineſs, make the body ſupple, &c. For this purpoſe, ſometimes pure oil of olives was uſed; ſometimes certain ſimples were infuſed in it, as the leaves of myrtle and roſes; and the latter kind of oil was in much requeſt among the ancients. There were other ſorts of oils ſometimes in uſe, however, which were much more compounded. Hippocrates ſpeaks of one called *ſuſinum*, which were made of the flowers of the iris, of ſome aromatics, and of an ointment of narciſſus made with the flowers of narciſſus and aromatics infuſed in oil. But the moſt compounded of all his ointments was that called *netopum*, which he made particularly for women; and conſiſted, according to Heſychius, of a great number of ingredients. Another ointment, to which he gave the name of *ceratum*, was compoſed of oil and wax. An ointment which he recommends for the ſoftening of a tumor, and the cleanſing of a wound, was made by the following receipt; "Take the quantity of a nut of the marrow or fat of a ſheep, of maſtic or turpentine the quantity of a bean, and as much wax; melt theſe over a fire, with oil of roſes, for a ceratum." Sometimes he added pitch and wax, and with a ſufficient quantity of oil, made a compoſition ſomewhat more conſiſtent than the former, which he called *cerapiſſus*.

28 Cataplaſms

Cataplaſms were a ſort of remedies leſs conſiſtent than the two former. They were made of powders or herbs ſteeped or boiled in water or ſome other liquor, to which ſometimes they added oil. They were uſed with a view to ſoften or reſolve tumors, ripen abſceſſes, &c. though they had alſo cooling cataplaſms made of the leaves of beets or oak, fig or olive-trees, boiled in water.

29 Collyria.

Laſtly, to complete the catalogue of the external remedies uſed by Hippocrates, we ſhall mention a ſort of medicine called *collyrium*. It was compounded of powders, to which was added a ſmall quantity of ſome ointment, or juice of a plant, to make a ſolid or dry maſs; the form of which was long and round, which was kept for uſe. Another compoſition of much the ſame nature was a ſort of lozenge of the bigneſs of a ſmall piece of money, which was burnt upon coals for a perfume, and powdered for particular uſes. In his works we find likewiſe deſcriptions of powders for ſeveral uſes, to take off fungous fleſh, and to blow into the eyes in ophthalmies, &c.

Theſe were almoſt all the medicines uſed by Hippocrates for external purpoſes. The compound medicines given inwardly were either liquid, ſolid, or lambative. The liquid ones were prepared either by decoction or infuſion in a proper liquor, which, when ſtrained, was kept for uſe; or by macerating certain powders in ſuch liquors, and ſo taking them together, or by mixing different kinds of liquors together. The ſolid medicines conſiſted of juices inſpiſſated; of gums, reſins, or powders, made up with them or with honey, or ſomething proper to give the neceſſary conſiſtence to the medicine. Theſe were made up in a form and quantity fit to be ſwallowed with eaſe. The lambative was of a conſiſtence between ſolid and fluid; and the patients were obliged to keep it for ſome time to diſſolve in the mouth, that they might ſwallow it leiſurely. This remedy was uſed to take off the acrimony of theſe humours which ſometimes fall upon this part, and provoke coughing and other inconveniences. The baſis of this laſt compoſition was honey. It is worth our obſervation, that the compound medicines of Hippocrates were but very few, and compoſed only of four or five ingredients at moſt, and that he not only underſtood pharmacy, or the art of compounding medicines, but prepared ſuch as he uſed himſelf, or cauſed his ſervants prepare them in his houſe by his directions.

We have thus given ſome account of the ſtate of medicine as practiſed and taught by Hippocrates, who, as we have already obſerved, has for many ages been juſtly conſidered as the father of phyſic. For when we attend to the ſtate in which he found medicine, and the condition in which he left it, we can hardly beſtow ſufficient admiration on the judgment and accuracy of his obſervations. After a life ſpent in unwearied induſtry, he is ſaid to have died at Lariſſa, a city in Theſſaly, in the 102d year of his age, 361 years before the birth of Chriſt.

After the days of Hippocrates, medicine in ancient Greece gradually derived improvement from the labours of other phyſicians of eminence. And we may particularly mention three to whom its future progreſs ſeems to have been not a little indebted, viz. Praxagoras, Eraſiſtratus, and Herophilus.

30 Praxagoras

The firſt phyſician of eminence who differed conſiderably in his practice from Hippocrates was Praxagoras. Cœlius Aurelianus acquaints us, that he made great uſe of vomits in his practice, inſomuch as to exhibit them in the iliac paſſion till the excrements were diſcharged by the mouth. In this diſtemper he alſo adviſed, when all other means failed, to open the belly, cut the inteſtine, take out the indurated fæces, and then to ſew up all again; but this practice has not probably been followed by any ſubſequent phyſician.

31 Eraſiſtratus

Eraſiſtratus was a phyſician of great eminence, and flouriſhed in the time of Seleucus, one of the ſucceſſors of Alexander the Great. According to Galen, he entirely baniſhed veneſection from medicine; though ſome affirm that he did not totally diſcard it, but only uſed it leſs frequently than other phyſicians. His reaſons for diſapproving of veneſection are as follow: It is difficult to ſucceed in veneſection, becauſe we cannot always ſee the vein we intend to open, and becauſe we are not ſure but we may open an artery inſtead of a vein. We cannot aſcertain the true quantity to be taken. If we take too little, the intention is by no means anſwered; if we take too much, we run a riſk of deſtroying the patient. The evacuation of the venous blood alſo is ſucceeded by that of the ſpirits, which on that occaſion paſs from the arteries into the veins. It muſt likewiſe be obſerved, that as the inflammation is formed in the arteries by the blood coagulated in their orifices, veneſection muſt of courſe be uſeleſs and of no effect.

As Eraſiſtratus did not approve of veneſection, ſo neither did he of purgatives, excepting very rarely, but exhibited clyſters and vomits; as did alſo his maſter Chryſippus. He was of opinion, however, that the clyſters ſhould be mild; and condemned the large quantity and acrid quality of thoſe uſed by the ancients. The reaſon why purgatives were not much uſed by him was, that he imagined purging and veneſection could anſwer no other purpoſe than diminiſhing the fulneſs of the veſſels; and for this purpoſe he aſſerted that there were more effectual means than either phlebotomy or purging. He aſſerted that the humours diſcharged by cathartics were not the ſame in the body that they appeared after the diſcharge; but that the medicines changed their nature, and produced a kind of corruption in them. This opinion has ſince been embraced by a great number of phyſicians. He did not believe that purgatives acted by attraction; but ſubſtituted in the place of this principle what Mr Le Clerc imagines to be the ſame with Ariſtotle's *fuga vacui*. The principal remedy ſubſtituted by him in place of purging and veneſection was abſtinence. When this, in conjunction with clyſters and vomits, was not ſufficient to eradicate the diſeaſe, he then had recourſe to exerciſe. All this was done with a view to diminiſh the plenitude, which, according to him, was the moſt frequent cauſe of all diſeaſes. Galen alſo informs us, that Eraſiſtratus had ſo great an opinion of the virtues of ſuccory in diſeaſes of the viſcera and lower belly, and eſpecially in thoſe of the liver, that he took particular pains to deſcribe the method of boiling it, which was, to boil it in water till it was tender; then to put it into boiling water a ſecond time, in order to deſtroy its bitterneſs; afterwards to take it out of the water, and preſerve it in a veſſel with oil; and laſtly, when it is to be uſed, add a little weak vinegar to it. Nay, ſo minute and circumſtantial was Eraſiſtratus with regard to the preparation of his favourite ſuccory, that he gave orders to tie ſeveral of the plants together, becauſe that was the more commodious method of boiling them. The reſt of Eraſiſtratus's medicines conſiſted almoſt entirely of regimen; to which he added ſome topical remedies, ſuch as cataplaſms, fomentations, and unctions. In ſhort, as he could neither endure compounded medicines, nor ſuperſtitious and fine-ſpun reaſonings, he reduced medicine to a very ſimple and compendious art.

With regard to ſurgery, Eraſiſtratus appears to have been very bold; and as an anatomiſt he is ſaid to have been exceedingly cruel, inſomuch that he is repreſented by ſome as having diſſected criminals while yet alive *. In a ſcirrhous liver, or in tumors of that organ, Cœlius Aurelianus obſerves, that Eraſiſtratus made an inciſion through the ſkin and integuments, and having opened the abdomen he applied medicines immediately to the part affected. But tho' he was thus bold in performing operations on the liver, yet he did not approve of the paracenteſis or tapping in the dropſy; becauſe (ſaid he) the waters being evacuated, the liver, which is inflamed and become hard like a ſtone, is more preſſed by the adjacent parts which the waters kept at a diſtance from it, ſo that by this means the patient dies. He declared alſo againſt drawing teeth which were not looſe; and uſed to tell thoſe who talked with him on this operation, That in the temple of Apollo there was to be ſeen an inſtrument of lead for drawing teeth; in order to inſinuate that we muſt not attempt the extirpation of any but ſuch as are looſe, and call for no greater force for their extirpation than what may be ſuppoſed in an inſtrument of lead.

32 Herophilus.

Herophilus, the diſciple of Praxagoras, and cotemporary of Eraſiſtratus, followed a leſs ſimple practice: he made ſo great uſe of medicines both ſimple and compound, that neither he nor his diſciples would undertake the cure of any diſorder without them. He ſeems alſo to have been the firſt who treated accurately of the doctrine of pulſes, of which Hippocrates had but a ſuperficial knowledge. Galen, however, affirms, that on this ſubject he involved himſelf in difficulties and advanced abſurdities; which indeed we are not greatly to wonder at, conſidering the time in which he lived. He took notice of a diſeaſe at that time pretty rare, and to which he aſcribes certain ſudden deaths. He calls it a *palſy of the heart*; and perhaps it may be the ſame diſeaſe with what is now termed the *angina pectoris*.

According to Celſus, it was about this time that medicine was firſt divided into three branches, viz. the dietetic, the pharmaceutical, and the chirurgical medicine. The firſt of theſe employed a proper regimen in the cure of diſeaſes; the ſecond, medicines; and the third, the operation of the hands: and the ſame author informs us, that theſe three branches became now the buſineſs of as many diſtinct claſſes of men; ſo that from this time we may date the origin of the three profeſſions of phyſicians, apothecaries, and ſurgeons.—Before this diviſion, thoſe called *phyſicians* diſcharged all the ſeveral offices belonging to the three profeſſions; and there were only two kinds of them, viz. one called *αρχιτεκτονικοι*, who only gave their advice to the patients, and directions to thoſe of an inferior claſs, who were called *δημιουργοι*, and worked with their hands either in the performing operations, or in the compoſition and application of remedies.

33 The Empirics.

The firſt grand revolution which happened in the medicinal art after the days of Herophilus and Eraſiſtratus was occaſioned by the founding of the empiric ſect by Serapion of Alexandria about 284 years before Chriſt. The diviſion into dogmatiſts and empirics had indeed ſubſiſted before; but about this time the latter party began to grow ſtrong, and to have champions publicly aſſerting its cauſe. Galen informs us, that Serapion uſed Hippocrates very ill in his writings, in which he diſcovered an exceſs of pride, ſelf-ſufficiency, and contempt for all the phyſicians that went before him. We have ſome ſketches of his practice in Cœlius Aurelianus, from which we may infer that he retained the medicines of Hippocrates and the other phyſicians who went before him, tho' he rejected their reaſoning. We know not what arguments he advanced for the ſupport of his ſentiments, ſince his works are loſt, as well as thoſe of the other empirics; and we ſhould know nothing at all of any

34 Serapion.

of

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* See Anatomy, *Hiſt.*

Serapion. of them, if their adverſaries had not quoted them in order to confute them.

The empirics admitted only one general method of obtaining ſkill in the medical art, which was by experience, called by the Greeks εμπειρια. From this word they took their name, and refuſed to be called after the founder or any champion of their ſect. They defined experience a knowledge derived from the evidence of ſenſe. It was either fortuitous, or acquired by deſign. For acquiring practical ſkill they recommended what they called τηρησις, or one's own obſervation, and the reading of hiſtories or caſes faithfully related by others. Hence they thought that we are enabled to know a diſeaſe by its reſemblance to others; and, when new diſeaſes occurred, to conclude what was proper to be done from the ſymptoms they had in common with others that were before known. They aſſerted, that obſervation ought principally to be employed in two different ways; firſt in diſcovering what things are ſalutary, and what are of an indifferent nature; and, ſecondly, what particular diſeaſe is produced by a certain concurrence of ſymptoms; for they did not call every ſymptom a diſeaſe, but only ſuch a combination of them as from long experience they found to accompany each other, and produced ſuch diſorders as began and terminated in the ſame manner.

On the other hand, the dogmatiſt affirmed, that there was a neceſſity for knowing the latent as well as the evident cauſes of diſeaſes, and that the phyſician ought to underſtand the natural actions and functions of the human body, which neceſſarily preſuppoſes a knowledge of the internal parts. By ſecret or latent cauſes they meant ſuch as related to the elements or principles of which our bodies are compoſed, and which are the origin of a good or bad ſtate of health. They aſſerted that it was impoſſible to know how to cure a diſeaſe without knowing the cauſe whence it proceeded; becauſe undoubtedly it behoved them to vary prodigiouſly in themſelves according to the different cauſes by which they were produced.

35. Aſclepiades. The next remarkable perſon in the hiſtory of phyſic is Aſclepiades, who flouriſhed in the century immediately preceding the birth of Chriſt. He introduced the philoſophy of Democritus and Epicurus into medicine, and ridiculed the doctrines of Hippocrates. He aſſerted, that matter conſidered in itſelf was of an unchangeable nature; and that all perceptible bodies were compoſed of a number of ſmaller ones, between which there were interſperſed an infinity of ſmall ſpaces totally void of all matter. He thought that the ſoul itſelf was compoſed of theſe ſmall bodies. He laughed at the principle called *Nature* by Hippocrates, and alſo at the imaginary faculties ſaid by him to be ſubſervient to her; and ſtill more at what he called *Attraction*. This laſt principle Aſclepiades denied in every inſtance, even in that of the loadſtone and ſteel, imagining that this phenomenon proceeded from a concourſe of corpuſcles, and a particular diſpoſition or modification of their pores. He alſo maintained, that nothing happened or was produced without ſome cauſe; and that what was called *nature* was in reality no more than *matter* and *motion*. From this laſt principle he inferred that Hippocrates knew not what he ſaid when he ſpoke of Nature as an intelligent being, and aſcribed qualities of different kinds to her. For the ſame reaſon he ridiculed the doctrine of Hippocrates with regard to criſes; and aſſerted that the termination of diſeaſes might be as well accounted for from mere matter and motion. He maintained, that we were deceived if we imagined that nature always did good; ſince it was evident that ſhe often did a great deal of harm. As for the days particularly fixed upon by Hippocrates for criſes, or thoſe on which we uſually obſerve a change either for the better or the worſe, Aſclepiades denied that ſuch alterations happened on thoſe days rather than on others. Nay, he aſſerted that the criſis did not happen at any time of its own accord, or by the particular determination of nature for the cure of the diſorder, but that it depended rather on the addreſs and dexterity of the phyſician; that we ought never to wait till a diſtemper terminates of its own accord, but that the phyſician by his care and medicines muſt haſten on and advance the cure.—According to him, Hippocrates and other ancient phyſicians attended their patients rather with a view to obſerve in what manner they died than in order to cure them; and this under pretence that Nature ought to do all herſelf, without any aſſiſtance. Aſclepiades.

According to Aſclepiades; the particular aſſemblage of the various corpuſcles abovementioned, and repreſented as of different figures, is the reaſon why there are ſeveral pores or interſtices within the common maſs, formed by theſe corpuſcles; and why theſe pores are of a different ſize. This being taken for granted, as theſe pores are in all the bodies we obſerve, it muſt of courſe follow that the human body has ſome peculiar to itſelf, which, as well as thoſe of all other bodies, contain other minute bodies, which paſs and repaſs by thoſe pores that communicate with each other; and as theſe pores or interſtices are larger or ſmaller, ſo the corpuſcles which paſs through them differ proportionably as to largeneſs and to minuteneſs. The blood conſiſts of the largeſt of theſe corpuſcles, and the ſpirits, or the heat, of the ſmalleſt.

From theſe principles he infers, that as long as the corpuſcles are freely received by the pores, the body remains in its natural ſtate; and on the contrary, it begins to recede from that ſtate, when the corpuſcles find any obſtacle to their paſſage. Health therefore depends on the juſt proportion between the pores and the corpuſcles they are deſtined to receive and tranſmit; as diſeaſes, on the contrary, proceed from a diſporportion between theſe pores and the corpuſcles. The moſt uſual obſtacle on this occaſion proceeds from the corpuſcles embracing each other, and being retained in ſome of their ordinary paſſages, whether theſe corpuſcles arrive in too large a number, are of irregular figures, move too faſt or too ſlow, &c.

Among the diſorders produced by the corpuſcles ſtopping of their own accord, Aſclepiades reckoned phrenſies, lethargies, pleuriſies and burning fevers. Pains, in particular, are claſſed among the accidents which derive their origin from a ſtagnation of the largeſt of all the corpuſcles of which the blood conſiſts. Among the diſorders produced by the bad ſtate and diſpoſition of the pores, he placed deliquiums, languors, extenuations, leanneſs, and dropſies. Theſe laſt diſorders he thought proceeded from the pores being too much relaxed and opened; the dropſy in particular, he thinks, proceeds from the fleſh being perforated with various ſmall holes, which convert the nouriſhment received into them into water. Hunger, and eſpecially that ſpecies of it called *fames canina*, proceeds from an opening of the large pores of the ſtomach and belly; and thirſt from an opening of their ſmall ones. Upon the ſame principles he accounted for intermittent fevers. Quotidian fevers are cauſed by a retention of the largeſt corpuſcles, thoſe of the tertian kind by a retention of corpuſcules ſomewhat ſmaller, and quartan fevers are produced by a retention of the ſmalleſt corpuſcles of all.

The practice of Aſclepiades was ſuited to remove theſe imaginary cauſes of diſorders. He compoſed a book concerning common remedies, which he principally reduced to three, *viz.* geſtation, friction, and the uſe of wine. By various exerciſes he propoſed to render the pores more open, and to make the juices and ſmall bodies, which cauſe diſeaſes by their retention, paſs more freely; and while the former phyſicians had not recourſe to geſtation till towards the end of long continued diſorders, and when the patients, tho' entirely free from fever, were yet too weak to take ſufficient exerciſe by walking, Aſclepiades uſed geſtation from the very beginning of the moſt burning fevers. He laid it down as a maxim, that one fever was to be cured by another; that the ſtrength of the patient was to be exhauſted by making him watch and endure thirſt to ſuch a degree, that, for the two firſt days of the diſorder, he would not allow them to cool their mouths with a drop of water. Celſus alſo obſerves, that though Aſclepiades treated his patients like a butcher during the firſt days of the diſorder, he indulged them ſo far afterwards as even to give directions for making their beds in the ſofteſt manner. On ſeveral occaſions Aſclepiades uſed frictions to open the pores. The dropſy was one of the diſtempers in which this remedy was uſed; but the moſt ſingular attempt was, by this means, to lull phrenetic patients aſleep. But though he enjoined exerciſe ſo much to the ſick, he denied it to thoſe in health; a piece of conduct not a little ſurpriſing and extraordinary. He allowed wine freely to patients in fevers, provided the violence of the diſtemper was ſomewhat abated. Nor did he forbid it to thoſe who were afflicted with a phrenzy; nay, he ordered them to drink it till they were intoxicated, pretending by that means to make them ſleep; becauſe, he ſaid, wine had a narcotic quality and procured ſleep, which he thought abſolutely neceſſary for thoſe who labour under that diſorder. To lethargic patients he uſed it on purpoſe to excite them, and rouſe their ſenſes; he alſo made them ſmell ſtrong-ſcented ſubſtances, ſuch as vinegar, caſtor, and rue, in order to make them ſneeze; and applied to their heads cataplaſms of muſtard made up with vinegar.

Beſides theſe remedies, Aſclepiades enjoined his patients abſtinence to an extreme degree. For the firſt three days, according to Celſus, he allowed them no aliment whatever; but on the fourth began to give them victuals. According to Cælius Aurelianus, however, he began to nouriſh his patients as ſoon as the acceſſion of the diſeaſe was diminiſhed, not waiting till an entire remiſſion; giving to ſome aliments on the firſt, to others on the ſecond, to others on the third, and ſo on to the ſeventh day. It ſeems almoſt incredible to us, that people ſhould be able to faſt till this laſt mentioned term; but Celſus aſſures us, that abſtinence till the ſeventh day was enjoined by the predeceſſors of Aſclepiades, and by Heraclides Tarentinus.

36 Methodic ſect.

The next great revolution which happened in the medicinal art, was brought about by Themiſon, the diſciple of Aſclepiades, who lived not long before the time of Celſus, during the end of the reign of Auguſtus, or beginning of that of Tiberius. The ſect founded by him was called *methodic*, becauſe he endeavoured to find a method of rendering medicine more eaſy than formerly.

37 Themiſon.

He maintained, that a knowledge of the cauſes of diſeaſes was not neceſſary, provided we have a due regard to what diſeaſes have in common and analogous to one another. In conſequence of this principle, he divided all diſeaſes into two, or at moſt three, kinds. The firſt included diſeaſes ariſing from ſtricture; the ſecond, thoſe ariſing from relaxation; and the third, thoſe of a mixed nature, or ſuch as partook, both of ſtricture and relaxation.

Themiſon alſo aſſerted, that diſeaſes are ſometimes acute, and ſometimes chronical; that for a certain time they increaſe; that at a certain time they are at their height: and that at laſt they were obſerved to diminiſh. Acute diſeaſes, therefore according to him, muſt be treated in one way, and chronical ones in another; one method muſt be followed with ſuch as are in their augmentation, another with ſuch as are at their height, and a third with ſuch as are in their decleniſion. He aſſerted, that the whole of medicine conſiſted in the obſervation of that ſmall number of rules which are founded upon things altogether evident. He ſaid, that all diſorders, whatever their nature was, if included under any of the kinds abovementioned, ought to be treated preciſely in the ſame way, in whatever country and with whatever ſymptoms they happen to ariſe. Upon theſe principles, he defined medicine to be a method of conducting to the knowledge of what diſeaſes have in common with each other, and which at the ſame time is evident.

38 Theſſalus.

Themiſon was old when he laid the foundation of the Methodic ſect; and it was only brought to perfection by Theſſalus, who lived under the emperor Nero. Galen and Pliny accuſe this phyſician of intolerable inſolence and vanity, and report that he gave himſelf the air of deſpiſing all other phyſicians; and ſo intolerable was his vanity, that he aſſumed the title of *the conqueror of phyſicians*, which he cauſed to be put upon his tomb in the Appian way. Never was mountebank (ſays Pliny) attended by a greater number of ſpectators than Theſſalus had generally about him; and this circumſtance is the leſs to be wondered at, if we conſider that he promiſed to teach the whole art of medicine in leſs than ſix months. In reality, the art might be learned much ſooner if it comprehended no more than what the methodiſts thought neceſſary; for they cut off the examination of the cauſes of diſeaſes followed by the dogmatics; and ſubſtituted in the room of the laborious obſervations of the empirics, indications drawn from the analogy of diſeaſes, and the mutual reſemblance they bear to each other. The moſt ſkilful of all the methodic ſect, and he who put the laſt hand to it, was Soranus. He lived under the emperors Trajan and Adrian, and was a native of Epheſus.

39 Soranus.

One of the moſt celebrated medical writers of an-

Celſus.

tiquity was Celſus, whom we have already had occaſion to mention. Moſt writers agree that he lived in the time of Tiberius, but his country is uncertain. It is even diſputed whether or not he was a profeſſed phyſician. Certain it is, however, that his books on medicine are the moſt valuable of all the ancients next to thoſe of Hippocrates. From the latter, indeed, he has taken ſo much, as to acquire the name of the *Latin Hippocrates;* but he has not attached himſelf to him ſo cloſely as to reject the aſſiſtance of other authors. In many particulars he has preferred Aſclepiades. With him he laughs at the critical days of Hippocrates, and aſcribes the invention of them to a fooliſh and ſuperſtitious attachment to the Pythagorean doctrine of numbers. He alſo rejected the doctrine of Hippocrates with regard to veneſection, of which he made a much more general uſe; but did not take away ſo much at a time, thinking it much better to repeat the operation than weaken the patient by too great an evacuation at one time. He uſed cupping alſo much more frequently, and differed from him with regard to purgatives. In the beginning of diſorders, he ſaid, the patients ought to endure hunger and thirſt; but afterwards they were to be nouriſhed with good aliments; of which, however, they were not to take too much, nor fill themſelves all of a ſudden, after having faſted. He does not ſpecify how long the patient ought to practiſe abſtinence; but affirms, that in this particular it is neceſſary to have a regard to the diſeaſe, the patient, the ſeaſon, the climate, and other circumſtances of a like nature. The ſigns drawn from the pulſe he looked upon to be very precarious and uncertain. "Some (ſays he) lay great ſtreſs upon the beating of the veins or the arteries; which is a deceitful circumſtance, ſince that beating is ſlow or quick, and varies very much, according to the age, ſex, and conſtitution of the patient. It even ſometimes happens that the pulſe is weak and languid when the ſtomach is diſordered, or in the beginning of a fever, though in other reſpects the body be in a good ſtate; ſo that we might, in this latter caſe, be induced to believe, that a man is very weak, when he is juſt entering into a violent paroxyſm, has ſtrength enough left, and may be eaſily recovered from it. On the contrary, the pulſe is often high, and in a violent commotion, when one has been expoſed to the ſun, or comes out of a bath, or from uſing exerciſe; or when one is under the influence of anger, fear, or any other paſſion. Beſides the pulſe is eaſily changed by the arrival of the phyſician, in conſequence of the patient's anxiety to know what judgment he will paſs upon his caſe. To prevent this, the phyſician muſt not feel the patient's pulſe on his firſt arrival; he muſt firſt ſit down by him, aſſume a chearful air, inform himſelf of his condition; and if he is under any dread, endeavour to remove it by encouraging diſcourſe; after which he may examine the beating of the artery. This nevertheleſs does not hinder us from concluding, that if the ſight of the phyſician alone can produce ſo remarkable a change in the pulſe, a thouſand other cauſes may produce the ſame effect." But although Celſus thought for himſelf, and in not a few particulars differed from his predeceſſors, yet in his writings, which are not only ſtill preſerved, but have gone through almoſt innumerable editions, we have a compendious view of the practice of almoſt all his predeceſſors; and he treats of the healing art in all its branches, whether performed *manu, victu, vel medicamentis.* His writings, therefore, will naturally be had recourſe to by every one who wiſhes either to become acquainted with the practice of the ancients prior to the fall of the Roman empire, or to read medical Latin in its greateſt purity.

41 Galen.

About the 131ſt year after Chriſt, in the reign of the emperor Adrian, lived the celebrated Galen, a native of Pergamus, whoſe name makes ſuch a conſpicuous figure in the hiſtory of phyſic. At this time the dogmatic, empiric, methodic, and other ſects, had each their abettors. The methodics were held in great eſteem, and looked upon to be ſuperior to the dogmatics, who were ſtrangely divided among themſelves, ſome of them following Hippocrates, others Eraſiſtratus, and others Aſclepiades. The empirics made the leaſt conſiderable figure of any. Galen undertook the reformation of medicine, and reſtored dogmatiſm. He ſeems to have been of that ſect which was called *eclectic*, from their chooſing out of different authors what they eſteemed good in them, without being particularly attached to any one more than the reſt. This declaration he indeed ſets out with; but, notwithſtanding this, he follows Hippocrates much more than any of the reſt, or rather follows nobody elſe but him. Though before his time ſeveral phyſicians had commented on the works of Hippocrates, yet Galen pretends that none of them had underſtood his meaning. His firſt attempt therefore was to explain the works of Hippocrates; with which view he wrote a great deal, and after this ſet about compoſing a ſyſtem of his own. In one of his books entitled, "Of the eſtabliſhment of medicine," he defines the art to be one which teaches to preſerve health and cure diſeaſes. In another book, however, he propoſes the following definition: "Medicine (ſays he) is a ſcience which teaches what is ſound, and what is not ſo; and what is of an indifferent nature, or holds a mediun between what is ſound and what is the reverſe." He affirmed, that there are three things which conſtitute the object of medicine, and which the phyſician ought to conſider as ſound, as not ſound, or of a neutral and different nature. Theſe are the body itſelf, the ſigns, and the cauſes. He eſteems the human body ſound, when it is in a good ſtate or habit with regard to the ſimple parts of which it is compoſed, and when beſides there is a juſt proportion between the organs formed of theſe ſimple parts. On the contrary, the body is reckoned to be unſound, when it recedes from this ſtate, and the juſt proportion abovementioned. It is in a ſtate of neutrality or indifference, when it is in a medium between ſoundneſs and its oppoſite ſtate. The ſalutary ſigns are ſuch as indicate preſent health, and prognoſticate that the man may remain in that ſtate for ſome time to come. The inſalubrious ſigns, on the contrary, indicate a preſent diſorder, or lay a foundation for ſuſpecting the approach of one. The neutral ſigns, or ſuch as are of an indifferent nature, denote neither health nor indiſpoſition, either for the preſent, or for the time to come. In like manner he ſpeaks of cauſes ſalutary, unſalutary, and indifferent.

Theſe three diſpoſitions of the human body, that is, ſoundneſs, its reverſe, and a neutral ſtate, comprehend all the difference between health and diſorder or indiſpodiſpoſition: and each of theſe three ſtates or diſpoſitions has a certain extent peculiar to itſelf. A ſound habit of body, according to the definition of it already given, is very rare, and perhaps never to be met with; but this does not hinder us to ſuppoſe ſuch a model for regulating our judgment with reſpect to different conſtitutions. On this principle Galen eſtabliſhes eight other principal conſtitutions, all of which differ more or leſs from the perfect model abovementioned. The four firſt are ſuch as have one of the four qualities of hot, cold, moiſt, or dry, prevailing in too great a degree; and accordingly receive their denomination from that quality which prevails over the reſt. The four other ſpecies of conſtitutions receive their denomination from a combination of the abovementioned; ſo that, according to his definition, there may be a hot and dry, a hot and moiſt, a cold and moiſt, and a cold and dry, conſtitution. Beſides theſe differences, there are certain others which reſult from occult and latent cauſes, and which, by Galen, are ſaid to ariſe from an *idioſyncraſy* of conſtitution. It is owing to this idioſyncraſy that ſome have an averſion to one kind of aliment and ſome to another; that ſome cannot endure particular ſmells, &c. But though theſe eight laſt-mentioned conſtitutions fall ſhort of the perfection of the firſt, it does not thence follow, that thoſe to whom they belong are to be claſſed among the valetudinary and diſeaſed. A diſeaſe only begins when the deviation becomes ſo great as to hinder the action of the parts.

Galen deſcribes at great length the ſigns of a good or bad conſtitution, as well as thoſe of what he calls a *neutral habit*. Theſe ſigns are drawn from the original qualities of cold, hot, moiſt, and dry, and from their juſt proportion or diſproportion with reſpect to the bulk, figure, and ſituation, of the organical parts. With Hippocrates he eſtabliſhes three principles of an animal body; the parts, the humours, and the ſpirits. By the parts he properly meant no more than the ſolid parts; and theſe he divided into ſimilar and organical. Like Hippocrates, he alſo acknowledged four humours; the blood, the phlegm, the yellow bile and black bile. He eſtabliſhed three different kinds of ſpirits; the vital, the animal, and the natural. The firſt of theſe are, according to him, nothing elſe but a ſubtle vapour ariſing from the blood, which draws its origin from the liver, the organ or inſtrument of ſanguification. After theſe ſpirits are conveyed to the heart, they, in conjunction with the air we draw into the lungs, become the matter of the ſecond ſpecies, that is, of the vital ſpirits, which are again changed into thoſe of the animal kind in the brain. He ſuppoſed that theſe three ſpecies of ſpirits ſerved as inſtruments of three kinds of faculties, which reſide in the reſpective parts where theſe faculties are formed. The natural faculty is the firſt of theſe, which he placed in the liver, and imagined to preſide over the nutrition, growth, and generation, of the animal. The vital faculty he lodged in the heart, and ſuppoſed that by means of the arteries it communicated warmth and life to all the body. The animal faculty, the nobleſt of all the three, and with which the reaſoning or governing faculty was joined, according to him, has its ſeat in the brain; and, by means of the nerves, diſtributes a power of motion and ſenſation to all the parts, and preſides over all the other faculties. The original ſource or principle of motion in all theſe faculties, Galen, as well as Hippocrates, defines to be *Nature*.

Upon theſe principles Galen defined a diſeaſe to be "ſuch a preternatural diſpoſition or affection of the parts of the body, as primarily, and of itſelf, hinders their natural and proper action." He eſtabliſhed three principal kinds of diſeaſes: the firſt relates to the ſimilar parts; the ſecond, to the organical; and the third is common to both theſe parts. The firſt kind of diſeaſes conſiſts in the intemperature of the ſimilar parts; and this is divided into an intemperature *without matter*, and an intemperature *with matter*. The firſt diſcovers itſelf when a part has more or leſs heat or cold than it ought to have without that change of quality in the part being ſupported and maintained by any matter. Thus, for inſtance, a perſon's head may be overheated and indiſpoſed by being expoſed to the heat of the ſun, without that heat being maintained by the continuance or congeſtion of any hot humour in the part. The ſecond ſort of intemperature is when any part is not only rendered hot or cold, but alſo filled with a hot or cold humour, which are the cauſes of the heat or cold felt in the part. Galen alſo acknowledged a ſimple intemperature: that is, when one of the original qualities, ſuch as heat or cold, exceeds alone and ſeparately; and a compound intemperature, when two qualities are joined together, ſuch as heat and dryneſs, or coldneſs and humidity. He alſo eſtabliſhed an equal and unequal temperature. The former is that which is equally in all the body, or in any particular part of it, and which creates no pain, becauſe it is become habitual, ſuch as dryneſs in the hectic conſtitution. The latter is diſtinguiſhed from the former, in that it does not equally ſubſiſt in the whole of the body, or in the whole of a part. Of this kind of intemperature we have examples in certain fevers, where heat and cold, equally, and almoſt at the ſame time, attack the ſame part; or in other fevers, which render the ſurface of the body cold as ice, while the internal parts burn with heat; or laſtly, in caſes where the ſtomach is cold and the liver hot.

The ſecond kind of diſorders, relating to the organical parts, reſults from irregularities of theſe parts, with reſpect to the number, bulk, figure ſituation, &c.; as when one has ſix fingers, or only four; when one has any part larger or ſmaller than it ought to be, &c. The third kind, which is common both to the ſimilar and the organical parts, is a ſolution of continuity, which happens when any ſimilar or compound part is cut, bruiſed, or corroded.

Like Hippocrates, Galen diſtinguiſhed diſeaſes into acute and chronical; and, with reſpect to their nature and genius, into benign and malignant; alſo into epidemic, endemic, and ſporadic.

After having diſtinguiſhed the kinds of diſeaſes, Galen comes to explain the cauſes; which he divides into external and internal. The external cauſes of diſeaſes, according to him, are ſix things, which contribute to the preſervation of health when they are well diſpoſed and properly uſed, but produce a contrary effect when they are imprudently uſed or ill diſpoſed. Theſe ſix things are, the air, aliments and drink, motion and reſt, ſleeping and watching, retention and excretion, and laſtly the paſſions. All theſe are called the *procatarctic* or *beginning* cauſes, becauſe they put in motion the internal cauſes; which are of two kinds, the *antecedent* and the *conjunct*. The former is diſcovered only by reaſoning; and conſiſts for the moſt part in a peccancy of the humours, either by plenitude or cacochymy, *i. e.* a bad ſtate of them. When the humours are in too large a quantity, the caſe is called a *plethora;* but we muſt obſerve, that this word equally denotes too large a quantity of all the humours together, or a redundance of one particular humour which prevails over the reſt. According to theſe principles, there may be a ſanguine, a bilious, a pituitous, or a melancholy plenitude: but there is this difference between the ſanguine and the three other plenitudes, that the blood, which is the matter of the former, may far ſurpaſs the reſt: whereas, if any of the three laſt mentioned ones do ſo, the caſe is no longer called *plenitude*, but *cacochymy;* becauſe the humours, abounding more than they ought, corrupt the blood. The cauſes he alſo divides into ſuch as are manifeſt and evident, and ſuch as are latent and obſcure. The firſt are ſuch as ſpontaneouſly come under the cognizance of our ſenſes when they act or produce their effects: the ſecond are not of themſelves perceptible, but may be diſcovered by reaſoning: the third ſort, *i. e.* ſuch as he calls *occult* or *concealed*, cannot be diſcovered at all. Among this laſt he places the cauſe of the hydrophobia.

He next proceeds to conſider the ſymptoms of diſeaſes. A ſymptom he defines to be "a preternatural affection depending upon a diſeaſe, or which follows it as a ſhadow does a body." He acknowledged three kinds of ſymptoms: the firſt and moſt conſiderable of theſe conſiſted in the action of the parts being injured or hindered; the ſecond in a change of the quality of the parts, their actions in the mean time remaining entire; the third related to defects in point of excretion and retention.

After having treated of ſymptoms, Galen treats of the *ſigns* of diſeaſes. Theſe are divided into *diagnoſtic* and *prognoſtic*. The firſt are ſo called becauſe they enable us to know diſeaſes, and diſtinguiſh them from each other. They are of two ſorts, *pathognomonic* and *adjunct*. The firſt are peculiar to every diſeaſe, make known its preciſe ſpecies, and always accompany it, ſo that they begin and end with it. The ſecond are common to ſeveral diſeaſes, and only ſerve to point out the difference between diſeaſes of the ſame ſpecies. In a pleuriſy, for inſtance, the pathognomonic ſigns are a cough, a difficulty of breathing, a pain of the ſide, and a continued fever; the adjunct ſigns are the various ſorts of matter expectorated, which are ſometimes bloody, ſometimes bilious, &c. —The diagnoſtic ſigns were drawn from the defective or diſordered diſpoſition of the parts, or from the diſeaſes themſelves; ſecondly, from the cauſes of diſeaſes; thirdly, from their ſymptoms; and laſtly, from the particular diſpoſitions of each body, from things which prove prejudicial and thoſe that do ſervice, and from epidemical diſeaſes.—The prognoſtic ſigns he gathered from the ſpecies, virulence, and peculiar genius of the diſeaſe: but as we have already ſpoken ſo largely concerning the prognoſtics of Hippocrates, it is ſuperfluous to be particular on thoſe of Galen.—His method of cure differed little from that of Hippocrates: but from the ſpecimen already given of Galen's method of teaching the medical art, it is evident that his ſyſtem was little elſe than a collection of ſpeculations, diſtinctions, and reaſonings; whereas that of Hippocrates was founded immediately upon facts, which he had either obſerved himſelf, or had learned from the obſervation of others.

The ſyſtem of Galen, however, notwithſtanding its defects and abſurdities, remained almoſt uncontradicted for a very long period. Indeed it may be conſidered as having been the prevailing ſyſtem till the inundation of the Goths and Vandals put an almoſt entire ſtop to the cultivation of letters in Europe. But during the general prevalence of the ſyſtem of Galen, there appeared ſome writers to whom medicine was indebted for improvements, at leaſt in certain particulars. Among the moſt diſtinguiſhed of theſe we may mention Oribaſius, Ætius, Alexander, and Paulus.

42 Oribaſius.

Oribaſius flouriſhed about the year 360, and was phyſician to the emperor Julian. He ſpeaks very fully of the effects of bleeding by way of ſcarification, a thing little taken notice of by former writers; from his own experience he aſſures us that he had found it ſucceſsful in a ſuppreſſion of the menſes, defluxions of the eyes, headach, and ſtraitneſs of breathing even when the perſon was extremely old. He tells his own caſe particularly, when the plague raged in Aſia, and he himſelf was taken ill, that the ſecond day he ſcarified his leg, and took away two pounds of blood; by which means he entirely recovered, as did ſeveral others who uſed it. In this author alſo we find the firſt deſcription of a ſurpriſing and terrible diſtemper, which he termed λυκανθρωπια, a ſpecies of melancholy and madneſs, which he deſcribes thus. "The perſons affected get out of their houſes in the night-time, and in every thing imitate wolves, and wander among the ſepulchres of the dead till day-break. You may know them by theſe ſymptoms: Their looks are pale; their eyes heavy, hollow, dry, without the leaſt moiſture of a tear; their tongue exceedingly parched and dry, no ſpittle in their mouth, extreme thirſt; their legs, from the falls and the bruiſes they receive, full of incurable ſores and ulcers."

43 Ætius.

Ætius lived very near the end of the fifth, or in the beginning of the ſixth century. Many paſſages in his writings ſerve to ſhow us how much the actual and potential cautery were uſed by the phyſicians of that age. In the palſy, he ſays, that he ſhould not at all heſitate to make an eſchar either way, and this in ſeveral places; one in the nape, where the ſpinal marrow takes its riſe, two on each ſide of it; three or four on the top of the head, one juſt in the middle, and three others round it. He adds, that in this caſe, if the ulcers continue running a good while, he ſhould not doubt of a perfect recovery. He is ſtill more particular when he comes to order this application for an inveterate aſthma, after all other remedies have been tried in vain. One, he ſays, ſhould be made on each ſide near the middle of the joining of the clavicle, taking care not to touch the wind-pipe: two other little ones are then to be made near the carotids under the chin, one on each ſide, ſo that the cauſtic may penetrate no further than the ſkin; two others under the breaſts, between the third and fourth ribs; and again, two more backwards towards the fifth and ſixth ribs. Beſides theſe there ought to be one in the middle of the thorax near the beginning of the xiphoid cartilage over the orifice of the ſtomach; one on each ſide between the eighth and ninth ribs; and three others in the back, one in the middle, and the two others juſt below it, on each ſide of the vertebræ. Thoſe below the neck ought to be pretty large, not very ſuperficial, not very deep: and all theſe ulcers ſhould be kept open for a very long time.

Ætius takes notice of the worms bred in different parts of the body called *dracunculi*, which were unknown to Galen. He ſeems alſo to be the firſt Greek writer among the Chriſtians, who gives us any ſpecimen of medicinal ſpells and charms; ſuch as that of a finger of St Blaſius for removing a bone which ſticks in the throat, and another in relation to a fiſtula. He gives a remedy for the gout, which he calls the *grand drier;* the patient is to uſe it for a whole year, and obſerve the following diet each month. "In September, he muſt eat and drink milk; In October, he muſt eat garlic; in November, abſtain from bathing; in December, he muſt eat no cabbage; in January, he is to take a glaſs of pure wine in the morning; in February, to eat no beet; in March, to mix ſweet things both in eatables and drinkables; in April, not to eat horſe-radiſh, nor in May the fiſh called *polypus;* in June, he is to drink cold water in a morning; in July, to avoid venery; and laſtly, in Auguſt, to eat no mallows." This may ſufficiently ſhow the quackery of thoſe times, and how ſuperſtition was begining to mix itſelf with the art.

44 Alexander. Alexander, who flouriſhed in the reign of Juſtinian, is a more original author than either of the two former. He confines himſelf directly to the tranſcribing the ſigns of diſeaſes, and the methods of cure, without meddling with anatomy, the materia medica, or ſurgery, as all the reſt did. He employs a whole book in treating of the gout. One method he takes of relieving this diſeaſe is by purging; and in moſt of the purges he recommends hermodactyls, of which he has a great opinion. In a cauſus, or burning fever, where the bile is predominant, the matter fit for evacuation, and the fever not violent, he prefers purging to bleeding, and ſays that he has often ordered purging in acute fevers with ſurpriſing ſucceſs. In the cauſus alſo, if a ſyncope happens from crude and redundant humours, he recommends bleeding. In ſyncope ſucceeding the ſuppreſſion of any uſual evacuation, he recommends bleeding, with frictions. The diagnoſtics upon which he founds this practice are the following: viz. a face paler and more ſwelled than uſual, a bloated habit of body, with a little ſluggiſh pulſe, having long intervals between the ſtrokes. In tertian, and much more in quartan fevers, he recommends vomits above all other remedies, and affirms that by this remedy alone he has cured the moſt inveterate quartans. On the bulimus, or canine appetite, he makes a new obſervation, viz. that it is ſometimes cauſed by worms. He mentions the caſe of a woman who laboured under this ravenous appetite, and had a perpetual gnawing at her ſtomach and pain in her head: after taking *hiera*, ſhe voided a worm above a dozen of cubits long, and was entirely cured of her complaints.—He is alſo the firſt author who takes notice of *rhubarb;* which he recommends in a weakneſs of the liver and dyſentery.—Alexander is recommended by Dr Freind as one of the beſt practical writers among the ancients, and well worthy the peruſal of any modern.

45 Paulus. Paulus was born in the iſland Ægina, and lived in the 7th century. He tranſcribes a great deal from Alexander and other phyſicians. His deſcriptions are ſhort and accurate. He treats particularly of womens diſorders; and ſeems to be the firſt inſtance upon record of a profeſſed *man-midwife*, for ſo he was called by the Arabians: and accordingly he begins his book with the diſorders incident to pregnant women. He treats alſo very fully of ſurgery; and gives ſome directions, according to Dr Freind, not to be found in the more ancient writers.

46 Arabian Phyſicians. After the downfall of the Roman empire, and when the inundation of Goths and Vandals had almoſt completely exterminated literature of every kind in Europe, medicine, though a practical art, ſhared the ſame fate with more abſtract ſciences. Learning in general, baniſhed from the ſeat of arms, took refuge among the eaſtern nations, where the arts of peace ſtill continued to be cultivated. To the Arabian phyſicians, as they have been called, we are indebted both for the preſervation of medical ſcience, as it ſubſiſted among the Greeks and Romans, and likewiſe for the deſcription of ſome new diſeaſes, particularly the ſmall-pox. Among the moſt eminent of the Arabians, we may mention Rhaſes, Avicenna, Albucaſes, and Avenzoar. But of their writings it would be tedious, and is unneceſſary to give any particular account.— 47 Rhaſes. They were for the moſt part, indeed, only copiers of the Greeks; we are, however, indebted to them for ſome improvements. They were the firſt who introduced chemical remedies, though of theſe they uſed but few, nor did they make any conſiderable progreſs in the chemical art. Anatomy was not in the leaſt improved by them, nor did ſurgery receive any advancement till the time of Albucaſis, who lived probably in the 12th century. They added a great deal to botany and the materia medica, by the introduction of new drugs, of the aromatic kind eſpecially, from the eaſt, many of which are of conſiderable uſe. They alſo found out the way of making ſugar; and by help of that, ſyrups; which two new materials are of great uſe in mixing up compound medicines.

With regard to their practice, in ſome few particulars they deviated from the Greeks. Their purging medicines were much milder than thoſe formerly in uſe; and even when they did preſcribe the old ones, they gave them in a much leſs doſe than formerly. The ſame reflection may be made concerning their manner of bleeding, which was never to that exceſſive degree practiſed by the Greeks. They deviated from Hippocrates, however, in one very trivial circumſtance, which produced a violent controverſy. The queſtion was, Whether blood in a pleuriſy ought to be drawn from the arm of the affected ſide or the oppoſite? Hippocrates had directed it to be drawn from the arm of the affected ſide; but the Arabians, following ſome other ancient phyſicians, ordered it to be drawn from the oppoſite one. Such was the ignorance of thoſe ages, that the univerſity of Salamanca in Spain made a decree, that no one ſhould dare to let blood but in the contrary arm; and endeavoured to procure an edict from the emperor Charles V. to ſecond

it;

Arabian Phyſicians.

it; alleging that the other method was of no leſs pernicious conſequence to medicine, than Luther's hereſy had been to religion.

48 College of Salernum.

49 Conſtantine.

In conſequence of the general decay of learning in the weſtern parts of the world, the Greek writers became totally forgot, becauſe nobody could read the language; and the Arabians, though moſtly copiers from them, enjoyed all the reputation that was due to the others. The Arabian phyſic was introduced into Europe very early, with the moſt extravagant applauſe: and not only this, but other branches of their learning, came into repute in the weſt; inſomuch that in the 11th century, the ſtudies of natural philoſophy and the liberal arts were called *the ſtudies of the Saracens.* This was owing partly to the cruſades undertaken againſt them by the European princes; and partly to the ſettlement of the Moors in Spain, and the intercourſe they and other Arabians had with the Italians. For, long before the time of the cruſades, probably in the middle of the 7th century, there were Hebrew, Arabic, and Latin profeſſors of phyſic ſettled at Salernum; which place ſoon grew into ſuch credit, that Charles the Great thought proper to found a college there in the year 802; the only one at that time in Europe. Conſtantine the African flouriſhed here towards the latter end of the 11th century. He was a native of Carthage; but travelled into the eaſt, and ſpent 30 years in Babylon and Bagdad, by which means he became maſter of the oriental languages and learning. He returned to Carthage; but being informed of an attempt againſt his life, made his eſcape into Apulia, where he was recommended to Robert Guiſcard, created in 1060 duke of that country, who made him his ſecretary. He was reputed to be very well verſed in the Greek, as well as the eaſtern tongues; and ſeems to have been the firſt who introduced either the Greek or Arabian phyſic into Italy. His works, however, contain nothing that is new, or material; though he was then counted a very learned man, and for that age no doubt was ſo.

50 State of medicine in the 14th and 16th centuries.

51 Sweating ſickneſs in England.

Moderns.

From this time to the end of the 15th and beginning of the 16th century, the hiſtory of phyſic furniſhes us with no intereſting particulars. This period, however, is famous for the introduction of chemiſtry into medicine, and the deſcription of three new diſtempers, the ſweating ſickneſs, the venereal diſeaſe, and the ſcurvy. The ſweating ſickneſs began in 1483, in the army of Henry VII. upon his landing at Milford-haven, and ſpread itſelf at London from the 21ſt of September to the end of October. It returned here five times, and always in ſummer; firſt in 1485, then in 1506, afterwards in 1517, when it was ſo violent that it killed many in the ſpace of three hours, ſo that numbers of the nobility died, and of the commonalty in ſeveral towns often the one half periſhed. It appeared the fourth time in 1528, and then proved mortal in ſix hours; many of the courtiers died of it, and Henry VIII. himſelf was in danger. In 1529, and only then, it infeſted the Netherlands and Germany, in which laſt country it did much miſchief. The laſt return of it was in 1551, and in Weſtminſter it carried off 120 in a day. Dr Caius deſcribes it as a peſtilent contagious fever, of the duration of one natural day; the ſweat he reckoned to be only a natural ſympton, or criſis of the diſtemper. It firſt affected ſome particular part, attended with inward heat and burning, unquenchable thirſt, reſtleſſneſs, ſickneſs at ſtomach, but ſeldom vomiting, headach, delirium, then faintneſs, and exceſſive drowſineſs. The pulſe was quick and vehement, and the breath ſhort and laborious.—Children, poor and old people, were leſs ſubject to it. Of others, ſcarce any eſcaped the attack, and moſt of them died. Even by travelling into France or Flanders they did not eſcape; and what is ſtill more ſtrange, the Scots were ſaid not to be affected: abroad the Engliſh only were ſeized, and foreigners in England were free. At firſt the phyſicians were much puzzled how to treat this diſeaſe. The only cure they ever found, however, was to carry on the ſweat for a long time; for, if it ſtopped, it was dangerous or fatal. The way, therefore, was for the patient to lie ſtill, and not expoſe himſelf to cold. If nature was not ſtrong enough to force out the ſweat, it was neceſſary to aſſiſt her by art, with cloaths, wine, &c. The violence of the diſtemper was over in 15 hours; but there was no ſecurity for the patient till 24 were paſſed. In ſome ſtrong conſtitutions there was a neceſſity to repeat the ſweating, even to 12 times. The removing out of bed was attended with great danger; ſome who had not ſweated enough fell into very ill fevers.—No fleſh meat was to be allowed in all the time of the diſtemper; nor drink for the firſt five hours. In the ſeventh, the diſtemper increaſed; in the ninth the delirium came on, and ſleep was by all means to be avoided. However terrible this diſtemper appeared at firſt, it ſeldom proved obſtinate, if treated in the abovementioned manner.

52 Paracelſus.

53 Appearance of the venereal diſeaſe.

In the beginning of the 16th century, the famous chemiſt Paracelſus introduced a new ſyſtem into medicine, founded on the principles of his art. The Galenical ſyſtem had prevailed till his time; but the practice had greatly degenerated, and was become quite trifling and frivolous. The phyſicians rejected the uſe of opium, mercury, and other efficacious remedies. Paracelſus, who made uſe of theſe, had therefore greatly the advantage over them; and now all things relating to medicine were explained on imaginary chemical principles. It will eaſily be conceived that a practice founded in this manner could be no other than the moſt dangerous quackery. At this time, however, it was neceſſary; for now a new diſeaſe over-ran the world, and threatened greater deſtruction than almoſt all the old ones put together, both by the violence of its ſymptoms, and its baffling the moſt powerful remedies at that time known.—This was the venereal diſeaſe, which is ſaid to have been imported from the Weſt-Indies by the companions of Chriſtopher Columbus. Its firſt remarkable appearance was at the ſiege of Naples in 1494, from whence it was ſoon after propagated through Europe, Aſia, and Africa. The ſymptoms with which it made the attack at that time were exceedingly violent, much more ſo than they are at preſent; and conſequently were utterly unconquerable by the Galeniſts. The quacks and chemiſts, who boldly ventured upon mercury, though they no doubt deſtroyed numbers by their exceſſive uſe of it, yet ſhowed that a remedy for this terrible diſtemper was at laſt found out, and that a proper method of treating it might ſoon be fallen upon. Shortly after, the Weſt-Indian ſpecific, guaiacum,

cum, was diſcovered: the materia medica was enriched with that and many other valuable medicines, both from the Eaſt and Weſt-Indies: which contributed conſiderably to the improvement of the practice of phyſic. At this period, as ſea voyages of conſiderable duration became more frequent, the ſcurvy became a more frequent diſtemper, and was of courſe more accurately deſcribed. But probably, from ſuppoſed analogy to the contagions which at that time were new in Europe, very erroneous ideas were entertained with regard to its being of an infectious nature: And it is not impoſſible, that from its being attended alſo with ulcers, it was on ſome occaſions confounded with ſyphilitic complaints.

54
Progreſs of medicine in the 17th and 18th centuries.

55
Diſcovery of the circulation.

The revival of learning, which now took place throughout Europe, the appearance of theſe new diſtempers, and the natural fondneſs of mankind for novelty, contributed greatly to promote the advancement of medicine as well as other ſciences. While at the ſame time, the introduction of the art of printing rendered the communication of new opinions as well as new practices ſo eaſy a matter, that to enumerate even the names of thoſe who have been juſtly rendered eminent for medical knowledge would be a very tedious taſk. It was not, however, till 1628 that Dr William Harvey of London demonſtrated and communicated to the public one of the moſt important diſcoveries reſpecting the animal economy, the circulation of the blood. This diſcovery, more effectually than any reaſoning, overturned all the ſyſtems which had ſubſiſted prior to that time. It may juſtly be reckoned the moſt important diſcovery that has hitherto been made in the healing art: for there can be no doubt that it puts the explanation of the phenomena of the animal body, both in a ſtate of health and diſeaſe, on a more ſolid and rational footing than formerly. It has not, however, prevented the riſe of numerous fanciful and abſurd ſyſtems. Theſe, though faſhionable for a ſhort time, and ſtrenuouſly ſupported by blind adherents, have yet in no long period fallen into deſerved contempt. And notwithſtanding the abilities and induſtry of Stahl, Hoffman, Boerhaave, and Cullen, we may eaſily venture to aſſert that no general ſyſtem has yet been propoſed which is not liable to innumerable and unſurmountable objections. Very great progreſs has indeed been made in explaining the philoſophy of the human body, from aſcertaining by deciſive experiment the influence of the circulating, the nervous, and the lymphatic ſyſtems in the animal economy. But every attempt hitherto made to eſtabliſh any general theory in medicine, that is to conduct the cure of every diſeaſe on a few general principles, has equally deviated from truth with thoſe of Hippocrates and Galen; and has equally tended to miſlead thoſe who have adopted it. Indeed we may with confidence venture to aſſert, that from the very nature of the ſubject itſelf, medicine does not admit of ſuch ſimplicity. No one can deny that the human body conſiſts of a very great number of different parts both ſolids and fluids. It is, however, equally certain, that each of theſe is from many different cauſes liable to deviations from the ſound ſtate. And although ſome ſlight changes may take place without what can be called a morbid affection, yet, we well know, that every change taking place to a certain degree in any one part will neceſſarily and unavoidably produce an affection of the whole. Hence we may without heſitation venture to affirm, that every general theory which can be propoſed, attempting to explain the phenomena, and conduct the cure of all diſeaſes on a few general principles, though for ſome time it may have ſtrenuous advocates, will yet in the end be found to be both ill-grounded and pernicious.

The art of medicine has been much more uſefully improved by careful attention to the hiſtory, theory, and practice of particular diſeaſes, and by endeavouring to aſcertain from cautious obſervations the ſymptoms by which they are to be diſtinguiſhed, the cauſes by which they are induced, and the means by which they are to be prevented, alleviated, or cured. On this footing, therefore, we ſhall endeavour to give a brief account of at leaſt the moſt important affections to which the human body is ſubjected, delivering what appear to us to be the beſt eſtabliſhed facts and obſervations reſpecting each.

But before entering on the conſideration of particular diſeaſes, on what has commonly been ſtyled the practice of medicine, it is neceſſary to give a general view of the moſt important functions of the animal body, and of the chief morbid affections to which they are ſubjected; a branch which has uſually been named the *Theory* or *Inſtitutions of Medicine*.

THEORY of MEDICINE, or an Account of the principal Functions of the Animal Body.

WHILE the functions of living animals, but particularly of the human ſpecies, are very numerous, the accounts given of theſe both in a ſtate of health and diſeaſe are very various. Without therefore pretending to enumerate the contradictory opinions of different authors, we ſhall here preſent the reader with a view of this ſubject, extracted from one of the lateſt and beſt publications reſpecting it, the *Conſpectus Medicinæ Theoreticæ* of Dr James Gregory, formerly profeſſor of the inſtitutions of medicine in the univerſity of Edinburgh, and now profeſſor of practice.

56
Diviſion of the functions to animal, vital, and natural.

In this work, which was firſt publiſhed in 1780, and afterwards reprinted under an enlarged form in 1782, Dr. Gregory introduces his ſubject by obſerving, that ſome functions of the human body relate to itſelf only, and others to external things. To the latter claſs belong thoſe which by phyſicians are called the *animal functions*; to which are to be referred all our ſenſes, as well as the power of voluntary motion, by which we become acquainted with the univerſe, and enjoy this earth. Among the functions which relate to the body, only ſome have been named *vital*, ſuch as the circulation of the blood and reſpiration; becauſe, without the conſtant continuance of theſe life cannot ſubſiſt. Others, intended for repairing the waſte of the ſyſtem, have been termed the *natural functions*;

Diviſion of functions.

tions: for by the conſtant attrition of the ſolids, and the evaporation of the fluid parts of the body, we ſtand in need of nouriſhment to ſupply this waſte; after which the putrid and excrementitious parts muſt be thrown out by the proper paſſages. The digeſtion of the food, ſecretion of the humours, and excretion of the putrid parts of the food, are referred to this claſs; which, though neceſſary to life, may yet be interrupted for a conſiderable time without danger.

57
Diſtinction of diſeaſes into ſimple and compound.

A *diſeaſe* takes place, when the body has ſo far declined from a ſound ſtate, that its functions are either quite impeded, or performed with difficulty. A diſeaſe therefore may happen to any part of the body either ſolid or fluid, or to any one of the functions: and thoſe may occur either ſingle, or ſeveral of them joined together; whence the diſtinction of diſeaſes into *ſimple* and *compound.*

We have examples of the moſt ſimple kinds of diſeaſes, in the rupture or other injury of any of the corporeal organs, by which means they become leſs fit for performing their offices; or, though the organs themſelves ſhould remain ſound, if the ſolids or fluids have degenerated from a healthy ſtate; or if, having loſt their proper qualities, they have acquired others of a different, perhaps of a noxious nature; or laſtly, if the moving powers ſhall become too weak or too ſtrong, or direct their force in a way contrary to what nature requires.

58
Symptoms.

The moſt ſimple diſeaſes are either productive of others, or of *ſymptoms,* by which alone they become known to us.—Every thing in which a ſick perſon is obſerved to differ from one in health is called a *ſymptom;* and the moſt remarkable of theſe ſymptoms, and which moſt conſtantly appear, define and conſtitute the diſeaſe.

The cauſes of diſeaſes are various; often obſcure, and ſometimes totally unknown. The moſt full and perfect proximate cauſe is that which, when preſent, produces a diſeaſe, when taken away removes it, and when changed alſo changes it.

59
Prediſponent cauſe.

There are alſo remote cauſes, which phyſicians have been accuſtomed to divide into the *prediſponent* and *exciting* ones. The former are thoſe which only render the body fit for a diſeaſe, or which put it into ſuch a ſtate that it will readily receive one.

60
Exciting cauſe.

The exciting cauſe is that which immediately produces the diſeaſe in a body already diſpoſed to receive it.

The prediſponent cauſe is always inherent in the body itſelf, though perhaps it originally came from without; but the exciting cauſe may either come from within or from without.

61
Proximate cauſe!

From the combined action of the prediſponent and exciting cauſes comes the *proximate* cauſe, which neither of the two taken ſingly is able to produce; ſeeing neither every exciting cauſe will produce a diſeaſe in every perſon, nor will every one prediſpoſed to a diſeaſe fall into it without an exciting cauſe.—A body prediſpoſed to diſeaſe therefore has already declined ſomewhat from a ſtate of perfect health, although none of its functions are impeded in ſuch a manner that we can truly ſay the perſon is diſeaſed. Yet ſometimes the prediſponent cauſe, by continuing long, may arrive at ſuch an height, that it alone, without the addition of any exciting cauſe, may produce a real diſeaſe.—Of this we have examples in the debility of the ſimple ſolids, the mobility of the living ſolids, and in plethora.—The exciting cauſe alſo, though it ſhould not be able immediately to bring on a diſeaſe; yet if it continues long, will by degrees deſtroy the ſtrongeſt conſtitution, and render it liable to various diſeaſes; becauſe it either produces a prediſponent cauſe, or is converted into it, ſo that the ſame thing may ſometimes be an exciting cauſe, ſometimes a prediſponent one; of which the inclemencies of the weather, ſloth, luxury, &c. are examples.

Origin of Diſeaſes.

62
Hereditary diſeaſes.

Diſeaſes, however, ſeem undoubtedly to have their origin from the very conſtitution of the animal machine; and hence many diſeaſes are common to every body when a proper exciting cauſe occurs, though ſome people are much more liable to certain diſeaſes than others. Some are hereditary; for as healthy parents naturally produce healthy children, ſo diſeaſed parents as naturally produce a diſeaſed offspring. Some of theſe diſeaſes appear in the earlieſt infancy; others occur equally at all ages; nor are there wanting ſome which lurk unſuſpected even to the lateſt old age, at laſt breaking out with the utmoſt violence on a proper occaſion. Some diſeaſes are born with us, even though they have no proper foundation in our conſtitution, as when a fœtus receives ſome hurt by an injury done to the mother; while others, neither born with us nor having any foundation in the conſtitution, are ſucked in with the nurſe's milk.

65
Diſeaſes from age and ſex.

Many diſeaſes accompany the different ſtages of life; and hence ſome are proper to infancy, youth, and old age. Some alſo are proper to each of the ſexes: eſpecially the weaker ſex, proceeding, no doubt, from the general conſtitution of the body, but particularly from the ſtate of the parts ſubſervient to generation. Hence the diſeaſes peculiar to virgins, to menſtruating women, to women with child, to lying-in-women, to nurſes, and to old women.

64
Diſeaſes from climate.

The climate itſelf, under which people live, produces ſome diſeaſes; and every climate hath a tendency to produce a particular diſeaſe, either from its exceſs of heat or cold, or from the mutability of the weather. An immenſe number of diſeaſes may be produced by impure air, or ſuch as is loaded with putrid, marſhy, and other noxious vapours. The ſame thing may happen likewiſe from corrupted aliment, whether meat or drink; though even the beſt and moſt nutritious aliment will hurt if taken in too great quantity; not to mention poiſons, which are endowed with ſuch pernicious qualities, that even when taken in a very ſmall quantity they produce the moſt grievous diſeaſes, or perhaps even death itſelf.

65
Diſeaſes from accidents.

Laſtly, from innumerable accidents and dangers to which mankind are expoſed, they frequently come off with broken limbs, wounds, and contuſions, ſometimes quite incurable; and theſe misfortunes, though proceeding from an external cauſe at firſt, often terminate in internal diſeaſes.

Hitherto we have mentioned only the dangers which come from without; but thoſe are not leſs, nor fewer in number, which come from within. At every breath, man pours forth a deadly poiſon both to himſelf and others. Neither are the effluvia of the lungs alone hurtful: there flows out from every pore of the body a moſt ſubtile and poiſonous matter, perhaps of a putreſcent nature, which being long accumulated, and not allowed to diffuſe itſelf through the air, infects the body with moſt grievous diſeaſes; nor does it ſtop here, but produces a contagion which ſpreads devaſtation far and wide among mankind. From too much or too little exerciſe of our animal-powers alſo no ſmall danger enſues. By inactivity either of body or mind, the vigour of both is impaired; nor is the danger much leſs from too great employment. By moderate uſe, all the faculties of the mind, as well as all the parts of the body, are improved and ſtrengthened; and here nature has appointed certain limits ſo that exerciſe can neither be too much neglected, nor too much increaſed, with impunity. Hence thoſe who uſe violent exerciſe, as well as thoſe who ſpend their time in ſloth and idolneſs, are equally liable to diſeaſes: but each to diſeaſes, of a different kind; and hence alſo the bad effects of too great or too little employment of the mental powers.

66
Diſeaſes from paſſions of the mind.

Beſides the dangers ariſing from thoſe actions of the body and mind which are in our own power, there are others ariſing from thoſe which are quite involuntary. Thus, paſſions of the mind, either when carried to too great exceſs, or when long continued, equally deſtroy the health: nay, will even ſometimes bring on ſudden death. Sleep alſo, which is of the greateſt ſervice in reſtoring the exhauſted ſtrength of the body, proves noxious either by its too great or too little quantity. In the moſt healthy body, alſo, many things always require to be evacuated. The retention of theſe is hurtful, as well as too profuſe an evacuation, or the excretion of thoſe things either ſpontaneouſly or artificially which nature directs to be retained. As the ſolid parts ſometimes become flabby, ſoft, almoſt diſſolved, and unfit for their proper offices; ſo the fluids are ſometimes inſpiſſated, and formed even into the hardeſt ſolid maſſes. Hence impeded actions of the organs, vehement pain, various and grievous diſeaſes. Laſtly, ſome animals are to be reckoned among the cauſes of the diſeaſes: namely ſuch as ſupport life at the expence of others: and theſe either invade us from without, or take up their reſidence within the body, gnawing the bowels while the perſon is yet alive, not only with great danger and diſtreſs to the patient, but ſometimes even producing death itſelf.

67
Vis medicatrix naturæ.

Man, however, is not left without defence againſt ſo many and ſo great dangers. The human body is poſſeſſed of a moſt wonderful power, by which it preſerves itſelf from diſeaſes, keeps off many, and in a very ſhort time cures ſome already began, while others are by the ſame means more ſlowly brought to a happy concluſion. This power, called the *autocrateia*, or *vis medicatrix naturæ*, is well known both to phyſicians and philoſophers, by whom it is moſt juſtly celebrated; this alone is ſufficient for curing many diſeaſes, and is of ſervice in all. Nay, even the beſt medicines operate only by exciting and properly directing this force; for no medicine will act on a dead carcaſe. But though phyſicians juſtly put confidence in this power, and though it generally cures diſeaſes of a ſlighter nature, it is not to be thought that thoſe of the more grievous kind are to be left to the unaſſiſted efforts of the *vis medicatrix*. Phyſicians therefore have a twofold error to avoid, namely, either deſpiſing the powers of nature too much, or putting too great confidence in them; becauſe in many diſeaſes theſe efforts are either too feeble or too violent, inſomuch that ſometimes they are more to be dreaded than even the diſeaſe itſelf. So far therefore is it from being the duty of a phyſician always to follow the footſteps of Nature, that it is often neceſſary for him to take a directly contrary courſe, and oppoſe her efforts with all his might.

68
Chemical analyſis of the animal ſolids.

After this general view of the functions of the animal body, of the nature and cauſes of diſeaſes, and of the powers by which theſe are to be combated, Dr Gregory proceeds to treat of the ſolid materials of which the body is formed. He tells us, that the animal ſolid, when chemically examined, yields earth, oil, ſalt, water, phlogiſton or inflammable air, and a great quantity of mephitic air. Theſe elements are found in various proportions in the different parts of the body; and hence theſe parts are endowed with very different mechanical powers, from the hardeſt and moſt ſolid bone to the ſoft and almoſt fluid retina. Nay, it is principally in this difference of proportion between the quantities of the different elements, that the difference between the ſolid and fluid parts of the animal conſiſt, the former having much more earth and leſs water in their compoſition than the latter. The coheſion, he thinks, is owing to ſomething like a chemical attraction of the elements for one another; and its cauſe is neither to be ſought for in the gluten, fixed air, nor earth. This attraction, however, is not ſo ſtrong but that even during life the body tends to diſſolution; and immediately after death putrefaction commences, provided only there be as much moiſture in it as will allow an inteſtine motion to go on. The greater the heat, the ſooner does putrefaction take place, and with the greater rapidity does it proceed; the mephitic air flies off, and together with it certain ſaline particles; after which, the coheſion of the body being totally deſtroyed, the whole falls into a putrid colluvies, of which at length all the volatile parts being diſſipated, nothing but the earth is left behind.

This analyſis, he owns, is far from being perfect; becauſe nobody has ever been able, by combining the chemical principles of fleſh, to reproduce a compound any thing like what the fleſh originally was; but, however imperfect the analyſis may be, it ſtill has the advantage of ſhowing in ſome meaſure the nature and cauſes of certain diſeaſes, and thus leads phyſicians to the knowledge of proper remedies.

69
Qualities of the animal ſolids.

The ſolid parts are fitted for the purpoſes of life in three ſeveral ways; namely, by their coheſion, their flexibility, and their elaſticity, all of which are various in the various parts of the body. Moſt of the functions of life conſiſt in various motions. In ſome the moſt violent and powerful motions are required: and therefore ſuch a degree of coheſion is neceſſary in thoſe parts as will be ſufficient for allowing them to perform their offices without any danger of laceration. It is therefore neceſſary that ſome of the ſolid parts ſhould be more flexible than others; and it is likewiſe neceſſary that theſe parts, along with their flexibility, ſhould have a power of recovering their former ſhape and ſituation, after the removal of the force by which they were altered.

Theſe variations in flexibility, within certain limits, ſeldom produce any material conſequence with regard to the health: though ſometimes, by exceeding the proper bounds, they may bring on real and very dangerous diſeaſes; and this either by an exceſs or diminution of their coheſion, flexibility, or elaſticity. By augmenting the coheſion, the elaſticity is alſo for the moſt part augmented, but the flexibility diminiſhed; by diminiſhing the coheſion, the flexibility becomes greater, but the elaſticity is diminiſhed.

The cauſes of theſe affections, though various, may be reduced to the following heads. Either the chemical compoſition of the matter itſelf is changed: or, the compoſition remaining the ſame, the particles of the ſolid may be ſo diſpoſed, that they ſhall more or leſs ſtrongly attract one another. As to the compoſition, almoſt all the elements may exiſt in the body in an undue proportion, and thus each contribute its ſhare to the general diſorder, But of many of theſe things we know very little; only it is apparent, that the fluid parts, which conſiſt chiefly of water, and the ſolid, which are made up of various elements are often in very different proportions; the more water, the leſs is the coheſion or elaſticity, but the greater the flexibility; and the reverſe happens, if the ſolid or earthy part predominates.

70
Cauſes affecting the ſolids.

The remote cauſes of theſe different ſtates, whether prediſponent or exciting, are very various. In the firſt place, idioſyncraſy itſelf, or the innate conſtitution of the body, contributes very much to produce the abovementioned effects. Some have naturally a much harder and drier temperament of the body than others; men, for inſtance, more than women; which can with the utmoſt difficulty, indeed ſcarce by any means whatever, admit of an alteration. The ſame thing takes place at different periods of life; for, from firſt to laſt, the human body becomes always drier and more rigid. Much alſo depends on the diet made uſe of, which always produces a correſponding ſtate of the ſolids in proportion to its being more or leſs watery. Neither are there wanting ſtrong reaſons for believing, that not only the habit of the body, but even the diſpoſition of the mind, depends very much on the diet we make uſe of. The good or bad concoction of the aliment, alſo the application of the nouriſhment prepared from it, and likewiſe the ſtate of the air with regard to moiſture or dryneſs, affects the temperament of the body not a little; and hence thoſe who inhabit mountains or dry countries, are very different from the inhabitants of low marſhy places. Laſtly, the manner of living contributes ſomewhat to this effect: Exerciſe preſſes out and exhales the moiſture of the body, if in too great quantity; on the contrary ſloth and lazineſs produce an effect directly oppoſite, and cauſe a redundancy of humour.

But, putting the chemical compoſition of the ſolid parts out of the queſtion altogether, they may be affected by many other cauſes. The condenſation, for inſtance, or compreſſion of the particles, whether by mechanical cauſes or by means of cold or heat, makes a conſiderable alteration in the ſtrength and elaſticity of every ſolid body. How much mechanical preſſure contributes to this may be underſtood from the experiments of Sir Clifton Wintringham; and hence alſo are we to deduce the reaſon of many facts of the higheſt importance in the animal economy; namely, the growth, ſtate, decreaſe of the body; its rigidity daily increaſing; and at laſt the unavoidable death incident to old age from a continuance of the ſame cauſes.

Perhaps the different denſity of the ſolids is in ſome meaſure owing to Nature herſelf; but it ſeems rather to depend more on the powers of exerciſe or inactivity in changing the ſtate of the ſolids, the effects of which on the body, whether good or bad, may hence be eaſily underſtood.

Heat relaxes and expands all bodies, but cold renders them more denſe and hard; the effects of which on the human body are well known to moſt people. Though the body is found to preſerve a certain degree of heat almoſt in every ſituation, it is impoſſible but that its ſurface muſt be affected by the temperature of the ambient atmoſphere: and we have not the leaſt reaſon to doubt that every part of the body may thus feel the effects of that temperature. What a difference is there between one who, expoſed to the ſouth-wind, becomes lazy and languid, ſcarce able to drag along his limbs; and one who feels the force of the cold north-wind, which renders the whole body alert, ſtrong, and fit for action?

That theſe various cauſes, each of which is capable of affecting the conſtitution of the body when taken ſingly, will produce much greater effects when combined, is ſufficiently evident. The experiments of Bryan Robinſon, the effects of the warm bath, and indeed daily experience, ſhow it fully.

It is not yet certainly known what is the ultimate ſtructure of the minuteſt parts of the animal-ſolid; whether it conſiſts of ſtraight fibres or threads, whoſe length is very conſiderable in proportion to their breadth, variouſly interwoven with one another, as Boerhaave ſuppoſes; or of ſpiral ones, admirably convoluted and interwoven with one another, as ſome microſcopical experiments ſeem to ſhow, or whether the cellular texture be formed of fibres and *laminæ*, and from thence the greateſt part of the body, as the celebrated Haller hath endeavoured to prove.

71
Cellular texture.

The cellular texture is obſerved throughout the whole body: it ſurrounds and connects the fibres themſelves, which are ſufficiently apparent in many of the organs; and ſlightly joins the different parts which ought to have any kind of motion upon the neighbouring ones. By a condenſation of the ſame ſubſtance alſo, the ſtrongeſt, and what ſeem the thinneſt, membranes are formed; the moſt ſimple of which, being accurately examined, diſcover the cellular ſtructure. This cellular ſubſtance ſometimes increaſes to a ſurpriſing degree, and all parts formed of it, membranes, veſſels, &c. eſpecially by a gentle diſtenſion; for a ſudden and violent diſtenſion either breaks it altogether, or renders it thinner. Sometimes alſo it grows between neighbouring parts, and joins theſe which nature has left free. Preternatural concretions of this kind are often obſerved after an inflammation of the lungs or of the abdominal viſcera; and theſe new membranes are found to be truly cellular. This ſubſtance, when cut, or by any other means divided, grows together of its own accord; but if, by reaſon of very great inflammation and ſuppuration, a large portion of the cellular texture has been deſtroyed, it is never again renewed, and an ugly ſcar is left. It is even ſaid, Cellular Texture.

ſaid, that this ſubſtance, in certain caſes, is capable of joining the parts either of the ſame body with one another, or of a foreign body with them; and upon this, if on any foundation, reſts the art of Taliacotius and that of tranſplanting teeth, lately ſo much talked of.

The cellular texture is in ſome places merely a kind of net-work, in others filled with fat. Wherever too great bulk or compreſſion would have been inconvenient or dangerous, as in the head, lungs, eyes, eyebrows, penis, ſcrotum, &c. there it collects no fat, but is lax, and purely reticulated; but between the muſcles of the body and limbs below the ſkin, in the abdomen, eſpecially in the omentum and about the kidneys, very much fat is ſecreted and collected.

72 Animal fat.

The fat is a pure animal oil, not very different from the expreſſed and mild vegetable ones; during life it is fluid, but of different degrees of thickneſs in different parts of the body. It is ſecreted from the blood, and is often ſuddenly reabſorbed into it, though pure oil is very rarely obſerved in the blood. It is indeed very probable, that oil, by digeſtion, partly in the primæ viæ, and partly in the lungs, is converted into gluten, and this again into oil by means of ſecretion; though no organs ſecreting the fat can be ſhown by anatomiſts. It is, however, probable, that there are ſuch organs; and that the cellular texture has ſome peculiar ſtructure in thoſe parts which are deſtined to contain the fat already ſecreted, without ſuffering it to paſs into other places; for it never paſſes into thoſe parts which are purely reticulated, although the cellular texture is eaſily permeable by air or water over the whole body from head to foot.

The fat is augmented by the uſe of much animal-food, or of any other that is oily and nouriſhing, provided the digeſtion be good; by the uſe of ſtrong drink, eſpecially malt-liquor; by much reſt of body and mind, much ſleep and inactivity, caſtration, cold, repeated bloodletting, and in general by whatever diminiſhes the vital and animal powers. Much, however, depends on the conſtitution of the body itſelf; nor is it poſſible to fatten a human creature at pleaſure like an ox. A certain degree of fatneſs, according to the age of the perſon, is a ſign and effect of good health; but when too great, it becomes a diſeaſe of itſelf, and the cauſe of other diſeaſes. It may always be very certainly removed by ſtrong exerciſe, little ſleep, and a ſpare and ſolid diet. The fat always makes up a conſiderable part of the bulk of the body, and very often by far the greateſt part. Its uſe ſeems to be to make the motion of the body more eaſy and free by leſſening the friction of the moving parts, and thus preventing the abraſion of the ſolids, which would otherwiſe happen. It is alſo of uſe to hinder the parts from growing together, which ſometimes happens, when by an ulcer or any other accident a part of the cellular texture containing the fat is deſtroyed. Beſides all this, the fat contributes not a little to the beauty of the body, by filling up the large interſtices between the muſcles, which would otherwiſe give the perſon a deformed and ſhocking appearance. It is thought to be nutritious, when abſorbed from its cells by the blood; but of this we have no great certainty. It ſeems to have ſome power of defending from the cold, ſeeing nature has beſtowed it in very great quantity on thoſe animals which inhabit the colder regions.

Animal Fat.

73 Vital ſolids.

Thoſe parts of the body which enjoy ſenſe and mobility, are called *living* or *vital* ſolids. They are the brain, cerebellum, medulla oblongata, ſpinal marrow, the nerves ariſing from theſe and diffuſed throughout the whole body, and which are diſtributed through the various organs of ſenſe and through the muſcles, and laſtly the muſcles themſelves. Senſation is much more general than mobility, as being common to all the parts already mentioned. Mobility is proper to the muſcular fibres alone: wherever there is ſenſation, therefore, we may believe that there are nerves; and wherever there is mobility, we may believe that muſcular fibres exiſt. Nay, even mobility itſelf ſeems to originate from the connection which the muſcles have with the nerves; for ſoon after the nerves are compreſſed, or tied, or cut, the muſcles to which they are diſtributed loſe their faculties; which happens, too, when the brain itſelf, or the origin of the nerves, is affected. Some reckon that the muſcles are produced from the nerves, and conſiſt of the ſame kind of matter. Both indeed have a ſimilar ſtructure, as being fibrous and of a white colour: for the muſcles when well freed from the blood, of which they contain a great abundance, are of this colour as well as the nerves; neither can the nervous fibres by any means be diſtinguiſhed from the muſcular fibres themſelves. Both have alſo ſenſation; and both ſtimulants and ſedatives act in the ſame manner, whether they be applied to the muſcles themſelves or to the nerves.

It is difficult for us to diſcover the origin of many parts of the body, or to aſcertain whether they are produced all at the ſame time or one after another: yet it muſt be owned, that many of the muſcular parts are obſerved to have attained a remarkable degree of ſtrength, while the brain is ſtill ſoft and almoſt fluid; and that the action of theſe muſcular part is required for the action and growth of the brain. The muſcles are alſo of a much firmer contexture than the nerves; and enjoy a power of their own, namely, that of irritability, of which the nerves never participate. Of neceſſity, therefore, either the muſcles muſt be conſtructed of ſome kind of matter different from that of the nerves; or if both are made of the ſame materials, their organization muſt be exceedingly different. But if the ſubſtance of the muſcles and nerves be totally different, we may eaſily be convinced that much of the one is always mixed with the other; for it is impoſſible to prick a muſcle even with the ſmalleſt needle, without wounding or lacerating many nervous fibres at the ſame time. Since, therefore, there is ſuch a cloſe connection between the muſcles and nerves both as to their functions and ſtructure, they are deſervedly reckoned by phyſiologiſts to be parts of the ſame genus, called the *genus nervoſum*, or *nervous ſyſtem*.

74 Senſe of feeling.

After treating of ſenſe in general, Dr Gregory proceeds to conſider particularly each of the ſenſes both external and internal. He begins with the ſenſe of feeling, as being the moſt ſimple, and at the ſame time in common to every part of the nervous ſyſtem. In ſome places, however, it is much more acute than in others; in the ſkin, for inſtance,

ſtance, and eſpecially in the points of the fingers. Theſe are reckoned to have *nervous papillæ*, which by the influx of the blood are ſomewhat erected in the action of contact, in order to give a more acute ſenſation; though indeed this opinion ſeems rather to be founded on a conjecture derived from the ſtructure of the tongue, which is not only the organ of taſte, but alſo a moſt delicate organ of touch, than upon any certain obſervations.

75 **Pain.** From the ſenſe of feeling, as well as all the other ſenſes, either pain or pleaſure may ariſe; nay, to this ſenſe we commonly refer both pain and almoſt all other troubleſome ſenſations, tho' in truth pain may ariſe from every vehement ſenſation. It is brought on by any great force applied to the ſentient part; whether this force comes from within or from without. Whatever, therefore, pricks, cuts, lacerates, diſtends, compreſſes bruiſes, ſtrikes, gnaws, burns, or in any manner of way ſtimulates, may create pain. Hence it is ſo frequently conjoined with ſo many diſeaſes, and is often more intolerable even than the diſeaſe itſelf. A moderate degree of pain ſtimulates the affected part, and by degrees the whole body; produces a greater flux of blood and nervous power to the part affected; and often ſtimulates to ſuch motions as are both neceſſary and healthful. Hence, pain is ſometimes to be reckoned among thoſe things which guard our life. When very violent, however, it produces too great irritation, inflammation and its conſequences, fever, and all thoſe evils which flow from too great force of the circulation; it diſorders the whole nervous ſyſtem, and produces ſpaſms, watching, convulſions, delirium, debility, and fainting. Neither the mind nor body can long bear very vehement pain; and indeed Nature has appointed certain limits, beyond which ſhe will not permit pain to be carried, without bringing on delirium, convulſions, ſyncope, or even death, to reſcue the miſerable ſufferer from his torments.

Long continued pain, even though in a more gentle degree, often brings on debility, torpor, palſy, and rigidity of the affected part. But if not too violent, nor accompanied with fever, ſickneſs, or anxiety, it ſometimes ſeems to contribute to the clearneſs and acuteneſs of the judgment, as ſome people teſtify who have been afflicted with the gout.

76 **Anxiety.** Anxiety is another diſagreeable ſenſation, quite different from pain, as being more obtuſe and leſs capable of being referred to any particular part, though frequently more intolerable than any pain. But we muſt take care to diſtinguiſh between this anxiety of which we treat in a medical ſenſe, and that which is ſpoken of in common diſcourſe. The latter does not at all depend on the ſtate of the body, but belongs entirely to the mind; and ariſes from a ſenſe of danger, or a foreſight of any misfortune. The former is truly corporeal; and derives, no leſs than pain, its origin from a certain ſtate of the body. Notwithſtanding this difference, however, it is very poſſible for both theſe kinds of anxiety to be preſent at the ſame time, or for the one to be the cauſe of the other. A very great bodily anxiety will ſtrike fear and deſpondency into the moſt reſolute mind; and mental anxiety, on the contrary, if very violent and long-continued, may induce the former, by deſtroying the powers of the body, eſpecially thoſe which promote the circulation of the blood.

Anxiety, in the medical ſenſe of the word, ariſes in the firſt place from every cauſe diſturbing or impeding the motion of the blood through the heart and large veſſels near it. Anxiety, therefore, may ariſe from many diſeaſes of the heart and its veſſels, ſuch as its enlargement, too great conſtriction, oſſification, polypus, palpitation, ſyncope, inflammation, debility, and alſo ſome affections of the mind. It is likewiſe produced by every difficulty of breathing, from whatever cauſe it may ariſe; becauſe then the blood paſſes leſs freely through the lungs: anxiety of this kind is felt deep in the breaſt. It is ſaid alſo to ariſe from the difficult paſſage of the blood through the liver or other abdominal viſcera.

A certain kind of anxiety is very common and troubleſome to hypochondriacal people; and ariſes from the ſtomach and inteſtines being either loaded with indigeſted and corrupted food, or diſtended with air produced by fermentation and extricated from the aliments. By ſuch a load, or diſtenſion, the ſtomach, which is a very delicate organ, becomes greatly affected. Beſides, the free deſcent of the diaphragm is thus hindered, and reſpiration obſtructed. Anxiety of this kind is uſually very much and ſuddenly relieved by the expulſion of the air; by which, as well as by other ſigns of a bad digeſtion, it is eaſily known. In theſe caſes the anxiety is uſually, though with little accuracy, referred to the ſtomach.

Anxiety alſo frequently accompanies fevers of every kind, ſometimes in a greater and ſometimes in a leſſer degree. In this caſe it ariſes as well from the general debility as from the blood being driven from the ſurface of the body and accumulated in the large veſſels; as in the beginning of an intermittent fever. Or it may ariſe from an affection of the ſtomach when overloaded with crude, corrupted aliment; or diſtended and nauſeated with too much drink, eſpecially medicated drink. As the fever increaſes, the anxiety of the patient becomes greater and greater; remarkably ſo, according to the teſtimony of phyſicians, either immediately before the criſis or on the night preceding it; as before the breaking out of exanthemata, hæmorrhagy, ſweat, or diarrhœa, which ſometimes remove fevers. The patient feels likewiſe an anxiety from the ſtriking in of any eruption or critical metaſtaſis. This ſenſation alſo accompanies fevers and moſt other diſeaſes, when the vital power is exhauſted, and death approaches, of which it is the forerunner and the ſign. It happens at that time, becauſe the vital powers, unable to perform their functions, cannot make the blood circulate. But what kind of anxiety this is, the other ſigns of approaching death ſhows very evidently. Moreover, in the time of ſleep, anxiety may ariſe from the ſame cauſes: hence frightful dreams, which frequently diſturb our repoſe with ſurpriſe and terror.

77 **Itching.** Itching, an uneaſy ſenſation, with a deſire of ſcratching the place affected, is often very troubleſome, altho' it ſeems to be more a-kin to pleaſure than to pain. As pain proceeds from too great an irritation, either chemical or mechanical, ſo does itching proceed from a ſlight one. Titillation, or friction, of a woollen ſhirt,

for inſtance, upon the ſkin of a perſon unaccuſtomed to it, and of a delicate conſtitution, excites itching; as do alſo many acrid foſſils, vegetables, and animals. Hence an itching is the firſt ſenſation after the application of cantharides, although the ſame, when augmented, becomes painful. The ſame effect is produced by any thing acrid thrown out upon the ſkin; as in exanthematic fevers, the diſeaſe called the *itch*, &c. Lice, worms, eſpecially aſcarides, irritating either the ſkin or the inteſtines, excite a troubleſome itching. Certain ſpecies of internal itching excites people to many neceſſary actions both in a diſeaſed and healthy ſtate; ſuch as the excretion of the fæces and urine, coughing, ſneezing, and the like.

Too acute a ſenſation over the whole body is very rarely if ever obſerved. In a particular part the ſenſe of feeling is often more acute than it ought to be, either from the cuticle itſelf being too thin and ſoft, or being removed; or from the part itſelf being inflamed, or expoſed to too great heat. It becomes obtuſe, or is even quite deſtroyed over the whole body, or in great part of it, from various affections of the brain and nerves; as when they are wounded, compreſſed, or defective in vital power. This is called *anaeſtheſia*, and ſometimes accompanies palſy.

This ſenſe may be deficient in a particular part, either from the nerve being diſeaſed, or from its being compreſſed or wounded, or from the part itſelf being expoſed to too great a degree of cold;—or from the ſcarf-ſkin which covers it being vitiated, either becoming too thick or hard, by the handling of too rough, or hard, or hot bodies, as is the caſe with glaſs-makers and ſmiths; or from the elevation of the cuticle from the ſubjacent cutis, or true ſkin itſelf, by the interpoſition of blood, ſerum, or pus; or from the cutis being macerated, relaxed, or become torpid, which ſometimes happens to hydropic perſons; or laſtly, from the whole organ being corrupted by gangrene, burning, cold, or contuſion. This ſenſe is very rarely depraved, unleſs perhaps in the caſe of delirium, when all the functions of the brain are diſturbed in a ſurpriſing manner.

78 Taſte.

The ſenſe next to be conſidered is that of taſte, the principal organ of which is the tongue; the nearer the tip of it, the more acute is the ſenſe, and the nearer the glottis ſo much the more obtuſe. It muſt be owned, however, that ſome kind of acrid ſubſtances, the taſte of which is ſcarce perceived upon the tip of the tongue, excite a moſt vehement ſenſation about its roots, or even in the throat itſelf. The tongue is endowed with many large and beautiful nervous papillæ, which ſeem to be the chief ſeat of this ſenſe, and in the act of taſting are elevated and erected, in order to give the more acute ſenſation.

Nothing can be taſted which is not ſoluble in the ſaliva, that, being applied in a fluid form, it may pervade the involucra of the tongue, and affect its nervous pulp; and hence inſoluble earths are quite inſipid. Neither is it ſufficient for a body to be ſoluble that it may be taſted: it muſt alſo have ſomething in it ſaline, or at leaſt acrid, in order to ſtimulate the nervous ſubſtance: and hence, whatever has leſs ſalt than the ſaliva is totally inſipid.

The taſte is rarely found to be too acute, unleſs through a fault in the epidermis which covers the tongue. If this be removed or wounded, or covered with ulcers, aphthæ, &c. then the taſte, becoming too acute, is painful: or ſometimes no other ſenſation than that of pain is felt. It may be impaired, as well as the ſenſe of feeling, from various diſeaſes of the brain and nerves; of which, however, the inſtances are but rare. In ſome people it is much more dull than in others; and in ſuch the ſenſe of ſmelling is uſually deficient alſo. The taſte is moſt commonly deficient on account of the want of ſaliva; for a dry tongue cannot perceive any taſte: hence this ſenſe is very dull in many diſeaſes, eſpecially in fevers, catarrhs, &c. as well on account of the defect of ſaliva as of appetite, which is of ſo much ſervice in a ſtate of health; or by reaſon of the tongue being covered with a viſcid mucus.

The taſte is frequently depraved; when, for example, we have a perception of taſte without the application of any thing to the tongue: or, if any thing be applied to it, when we perceive a taſte different from what it ought to be. This happens for the moſt part from a vitiated condition of the ſaliva, which is itſelf taſted in the mouth. Hence we may perceive a ſweet, ſaline, bitter, putrid, or rancid taſte, according to the ſtate of the ſaliva: which may be corrupted either from the general vitiated condition of the maſs of humours, or the glands which ſecret it; of the mouth itſelf; or even of the ſtomach, the vapours and eructations of which riſe into the mouth, eſpecially when the ſtomach is diſeaſed.

Beſides the faults of the ſaliva, however, the taſte may be vitiated from other cauſes; as, for inſtance, the condition of the nervous papillæ. This, however, is as yet but little known to us; for the taſte is ſometimes plainly vitiated when at the ſame time the ſaliva appears quite inſipid when taſted by other people.

Phyſicians, in almoſt every diſeaſe, but eſpecially in fevers, inquire into the ſtate of the tongue; not, indeed, without the greateſt reaſon: for from this they can judge of the condition of the ſtomach; of the thirſt, or rather the occaſion the patient has for drink, when, on account of his delirium or ſtupor, he neither feels his thirſt nor is able to call for drink. And, laſtly, from an inſpection of the tongue, phyſicians endeavour to form ſome judgement concerning the nature, increaſe, and remiſſion of the fever.

79 Smell.

After the ſenſe of taſte, Dr Gregory next treats of that of ſmell. Its ſeat is in that very ſoft and delicate membrane, filled with nerves and blood-veſſels, which covers the internal parts of the noſe, and the various ſinuſes and cavities proceeding from thence. This ſenſe is more acute about the middle of the ſeptum, and the *oſſa ſpongioſa*, where the membrane is thicker and ſofter, than in the deeper cavities, where the membrane is thinner, leſs nervous, and leſs filled with blood-veſſels; although even theſe do not ſeem to be altogether deſtitute of the ſenſe of ſmelling.

As by our taſte we judge of the ſoluble parts of bodies, ſo by our ſmell we judge of thoſe very volatile and ſubtile parts which fly off into the air; and like the organ of taſte, that of ſmell is kept moiſt, that it may have the more exquiſite ſenſation, partly by its proper mucus, and partly by the tears which deſcend from the eyes.

Some kinds of odours greatly affect the nervous ſyſtem

ſtem, and produce the moſt ſurpriſing effects. Some gratefully excite it, and immediately recruit the ſpirits when almoſt ſinking; while ſome produce fainting, nay, as it is alledged, even ſudden death. To this head alſo are we to refer thoſe antipathies, which, though truly ridiculous, are often not to be ſubdued by any force of mind.

This ſenſe is ſometime too acute, as well from ſome diſeaſe in the organ itſelf, which happens more rarely, as from the too great ſenſibility of the nervous ſyſtem in general, as is ſometimes obſerved in nervous fevers, phrenitis, and hyſteria. It is more frequently, however, too dull, either from diſeaſes of the brain and nerves, as from ſome violence done to the head, or from ſome internal cauſe; or it may proceed from a dryneſs of the organ itſelf, either on account of the cuſtomary humours being ſuppreſſed or turned another way, or from the membranes being oppreſſed with too great a quantity of mucus or of tears. Of both theſe caſes we have inſtances in the catarrh, where at firſt the noſtrils are dry, but afterwards are deluged with a thin humour, or ſtopped up with a thick one. But in theſe, and many other examples, the membrane of the noſe itſelf is affected with inflammation, relaxation, or too great tenſion, by which it is impoſſible but the nerves, which conſtitute a great part of it, muſt be vitiated. It is evident alſo, that whatever obſtructs the free entrance of the air into the noſtrils, or impedes its paſſage through them, muſt prove detrimental to the ſenſe of ſmelling.

80 Hearing.

The ſenſe of hearing is more frequently vitiated than almoſt any of the reſt, as having a moſt delicate organ, and one compoſed of many and very ſmall parts, of which an account is given under the article Anatomy.—It frequently becomes too acute; either from the general habit of the body being too irritable, ſuch as ſoon happens to hyſterical and lying-in-women; or from too great a ſenſibility of the brain itſelf, which is not unfrequently obſerved in fevers, as well as in phrenitis, and ſometimes in the true mania; or it may be from a diſeaſe of the ear itſelf, as when it is affected with inflammation, pain, or too great tenſion.—It may be rendered dull, or even be altogether deſtroyed, ſo that the perſon ſhall become totally deaf from the ſame cauſes acting with different degrees of force. This happens eſpecially from the want of the external ear; or from the meatus auditorius being ſtopped up with mucus, wax, or other matters; or from the ſides of the canal growing together, as ſometimes happens after ſuppuration or the ſmall-pox; or by the membrane of the tympanum becoming rigid or relaxed, or being eroded or ruptured; or the tympanum itſelf, or the Euſtachian tube, may from certain cauſes be obſtructed; or ſome of the little bones or membranes, or ſome of the muſcles of the labyrinth itſelf, may be affected with concretion, ſpaſm, palſy, or torpor; or laſtly, it may happen from diſeaſes from the brain and nerves, all the organs of hearing remaining ſound. Hence deafneſs is often a nervous diſeaſe, coming ſuddenly on, and going off of its own accord. Hence alſo it is common in old people, all of whoſe ſolid parts are too rigid, while their nervous parts have too little ſenſibility.

Perſons labouring under fevers, eſpecially of the typhous kind, often become deaf. When this comes on along with other ſigns of an oppreſſed brain, and a great proſtration of ſtrength, it may be a very bad ſign; but for the moſt part it is a very good one, even though accompanied with ſome degree of torpor or ſleepineſs.

A very common diſeaſe in the ſenſe of hearing is when certain ſounds, like thoſe of a drum, a bell, the falling of water, &c. are heard without any tremor in the air, or without a ſound perſon's hearing any thing. This diſeaſe is called *tinnitus aurium*, of which various kinds have been obſerved. For the moſt part it is a very ſlight tranſient diſorder; but ſometimes it is moſt obſtinate, long-continued, and troubleſome. It ſometimes ariſes from the ſlighteſt cauſe, ſuch as any thing partially ſtopping up the meatus auditorius or Euſtachian tube itſelf, ſo that acceſs is in part denied to the air; whence it happens that the latter ſtrikes the membrane of the tympanum, or perhaps the interior parts, unequally, and with too much force. Hence *bombi*, a kind of tinnitus, are heard even by the moſt healthy when they yawn.

A much more frequent and troubleſome ſpecies of tinnitus accompanies many diſeaſes both of the febrile and nervous kind. This is occaſioned partly by the increaſed impetus of the blood towards the head, with an increaſe of ſenſibility in the nervous ſyſtem itſelf, ſo that the very beatings of the arteries are heard; and partly from the increaſed ſenſation and mobility of the nerves and muſcles of the labyrinth; whence it happens, that the parts which ought to be at reſt until excited by the tremor of the air, begin to move of their own accord, and impart their motion to other parts which are already in a morbid ſtate of too great ſenſibility.

A tinnitus ſometimes ariſes from any vehement affection of the mind; ſometimes from a diſorder in the ſtomach; ſometimes from a rheumatic diſorder affecting the ears and head: or from a catarrh, which commonly affects the tube. Sometimes, however, the tinnitus alone affects the patient; and even this is a diſeaſe of no ſmall conſequence. Theſe various cauſes, however, both of this and other diſorders of the hearing, are often very difficult to be diſtinguiſhed, as well on account of the inacceſſible ſituation of the organ, as on account of the little knowledge we have of its action. But from whatever cauſe it ariſes, both this and the other various affections of the hearing can neither be cured certainly nor eaſily.

81 Sight.

Concerning the nature of the ſenſe of ſight, the reader may conſult the articles Anatomy and Optics. Of this ſenſe ſome ſlight diſorders, or rather varieties, are often obſerved. Thoſe perſons are called *ſhort-ſighted* who cannot ſee diſtinctly unleſs the object be very near them. This diſorder ariſes from too great a refraction of the rays by reaſon of their being too ſoon collected into a focus by the cryſtalline lens, and diverging again before they fall upon the retina, by which means they make an indiſtinct picture upon it. The moſt uſual cauſe is too great a convexity of the eye or ſome of its humours, as too prominent a cornea. Its a diſorder common to young people, which is ſometimes removed when they grow older. As ſoon as the firſt approaches of ſhort-ſightedneſs are obſerved, it is ſuppoſed it may be obviated by the perſon's accuſtoming himſelf to view remote objects, and keeping his eyes off very ſmall and near ones; as, on the contrary, it may be brought on by the oppoſite cuſtom; becauſe the eye accomodates itſelf ſomewhat to the diſtances of thoſe objects which it is accuſtomed to view. But a concave glaſs, which cauſes the rays of light to diverge more than naturally they would before falling upon the cornea, is the moſt ſimple and certain remedy.

Long-ſighted people are thoſe who cannot ſee an object diſtinctly unleſs it be at a conſiderable diſtance from them. This ariſes from cauſes contrary to the former: namely, the eye being too flat, ſo that there is no room for refracting the rays and bringing them into a focus. Hence this defect is common in old people, and remedied by the uſe of convex glaſſes.

Thoſe are called *nyctalopes* who ſee better with a very weak than with a ſtrong light. It is a defect very ſeldom to be met with in the human race, though every perſon is ſenſible of it who hath been long kept in the dark and is then ſuddenly brought into the light. The diſeaſe ariſes from too great a ſenſibility of the retina, and the pupil being too open.

The ſight is liable to many and grevous diſorders. It is ſharpened beyond meaſure, ſo that the perſon either perceives nothing diſtinctly, or with great pain, from the ſame cauſes that induce a ſimilar diſorder in the other ſenſes; namely, exceſſive ſenſibility in the general habit of body; or a particular ſtate of the brain common in phrenitis, or even in thoſe afflicted with fevers ariſing from inflammation or too great excitement; though more frequently from the condition of the eye itſelf, one becomes unable to bear the light. The inflammation of the tunica adnata, and the forepart of the ſclerotica, is communicated to the backparts of it, and from thence to the choroides and retina itſelf. Hence the light becomes intolerable, and viſion is attended with pain and great irritation, ſometimes inducing or augmenting a delirium.

The ſenſe of ſeeing is made dull, or even totally aboliſhed, by age; the aqueous humour not being ſupplied in ſufficient quantity, and the cornea and lens, or the vitreous humour, becoming ſhrivelled or decayed. It may likewiſe happen from the cornea becoming dry and opaque; which is to be imputed to the languid motion of the blood, and to great numbers of the ſmall veſſels being obſtructed or having their ſides concreted;—or from the cryſtalline lens becoming yellow like amber, and the retina itſelf leſs ſenſible, for old age diminiſhes every ſenſation. It is totally aboliſhed by injuries of the brain, the optic nerve, or the retina, even though the ſtructure of the organ ſhould remain ſound. This diſeaſe is called an *amauroſis*; and is eaſily known by the dilatation and immobility of the pupil, the humours of the eye remaining clear. It is commonly owing to congeſtion of blood; and ſometimes, where no congeſtion of blood can be ſhown, to mere torpor of the nerves. If it be only a torpor of part of the retina, we ſee black ſpots in thoſe things at which we look; or flies ſeem to paſs before our eyes, a very bad ſign in fevers, and almoſt always mortal. The ſight is aboliſhed alſo by the obſcurity or opacity of any of the parts through which the rays ought to paſs and be refracted; as if the cornea loſe its tranſparency by being covered with ſpots; or the aqueous humours become corrupted with blood, ſerum, or pus; or the lens (which often happens and which is called a *cataract*) becomes of a grey or brown colour, or the vitreous humour be in like manner corrupted; or laſtly, when all the humours being diſſolved, confuſed, and mixed together, by inflammation and ſuppuration, either do not ſuffer the light to paſs at all, or to paſs imperfectly and unequally; whence either no image is formed on the retina, or it appears obſcure, diſtorted, imperfect, and ill-coloured.

The ſight is alſo depraved, when things appear to it of a colour different from their own, or even in another ſituation and of another ſhape than they ought to have. This happens from the humours being tinctured with any unuſual colour, as is ſaid to happen in ſome inſtances of jaundice; or from an extravaſation and mixture of the blood with the aqueous humour. A ſurpriſing depravation alſo, or conſtant and perpetual defect of viſion, is not unfrequently obſerved in men otherwiſe very healthy, and who ſee quite clearly; namely, that they cannot diſtinguiſh certain colours, green, for example, from red*. Another depravation is, when, without any light being admitted to the eyes, ſparks, ſmall drops of a flame or gold colour, and various other colours, are obſerved to float before us. This is generally a very ſlight and tranſient diſorder, common to thoſe whoſe conſtitutions are very irritable; and ariſes from the ſlight impulſe, as it would ſeem, on the retina, by the veſſels beating more vehemently than uſual. A fiery circle is obſerved by preſſing the eye with the finger after the eye-lids are ſhut. The ſame reaſon, perhaps, may be given for thoſe ſparks which are ſeen by perſons labouring under the falling-ſickneſs, and increaſing to the ſize of an immenſe and luminous beam before they fall down in convulſions. A ſimilar beam thoſe who have recovered from hanging or drowning teſtify that they have obſerved: for by reaſon of the reſpiration being ſuppreſſed, the veſſels of the head ſwell and compreſs the whole brain and nervous parts of the head. Sparks of the ſame kind, and theſe too of no good omen, are obſerved in patients labouring under a fever, when a phrenitis or fierce delirium is at hand: and likewiſe in thoſe who are threatened with palſy, apoplexy or epilepſy.—A diſtinct but falſe perception, namely of viſible things which do not exiſt is to be imputed to ſome injury of the brain, to madneſs or a delirium, not to any diſeaſe of the eye.

A very frequent defect of viſion remains to be mentioned; namely, ſquinting. A perſon is ſaid to ſquint who has the axes of the eyes more oblique than uſual, and directed to different points. Hence a great deformity, and often an imperfect and confuſed viſion by which the objects are ſometines ſeen double. It is an evil for the moſt part born with the perſon, and often corrected by thoſe attempts which an infant makes to ſee more pleaſantly and diſtinctly; and this even without being conſcious of its own effects. It is alſo eaſily learned, eſpecially in infants, even without their own knowledge, by that kind of imitation which has a great influence over the human race, eſpecially in their tender years.—It is by no means, however, ſo eaſily unlearned.

Squinting is frequently occaſioned by a ſpaſm, palſy,

* See the article Colours (*incapacity of diſtinguiſhing*).

External Senſes.

rigidity, &c. of the muſcles which manage the eye: by epilepſy; by certain diſeaſes of the head, the hydrocephalus eſpecially; or by any great injury done to the head. Sometimes, though very rarely, it comes on ſuddenly without any known cauſe. It is very probable, however, that ſquinting often ariſes from a fault of the retinæ, when their central points, for inſtance, and thoſe ſimilarly placed with reſpect to the centre, do not agree. In this caſe there muſt be a contortion of the eye, that the object may not be ſeen double. This ſeems alſo to be the reaſon why ſquinting is horribly increaſed when the perſon brings the object near his eye in order to view it more perfectly. Or if the central point of either, or both, of the retinæ be inſenſible, or nearly ſo, it is neceſſary for the perſon to diſtort his eyes that he may have any diſtinct viſion of objects. If the optic nerve had not entered the retina obliquely, but paſſed directly through its centre, we would all either have ſquinted or ſeen double.

82 Vertigo. Phyſicians have referred to the ſenſe of viſion that moſt troubleſome ſenſation which we call a *vertigo:* though it ſeems rather to belong to that of feeling, or of conſciouſneſs; for in many inſtances the diſorder is not removed either in the dark or by ſhutting the eyelids. The vertigo takes place when external objects really at reſt ſeem to reel, to whirl round, to tremble, or to move in any manner of way. If the diſorder be very violent, the perſon is neither able to ſee, on account of a dimneſs of ſight; nor can he ſtand, as the powers fail which ought to govern the limbs. A nauſea alſo uſually accompanies the vertigo, and the one generally produces the other.

This diſorder is obſerved to be both the ſymptom and forerunner of ſome dangerous diſeaſes; ſuch as apoplexy, epilepſy, hyſteria; hæmorrhages from the noſe and other parts; ſuppreſſions of the menſes; plethora; fevers, as well ſuch as are accompanied with debility as thoſe in which there is an increaſed impetus of the blood towards the head. An injury done to the head alſo, but rarely one done to the eyes, unleſs in ſo far as it affects the whole head, brings on a vertigo. A vertigo may be likewiſe produced by a very great and ſudden loſs of blood or other fluid; by debility; ſyncope; various diſeaſes of the alimentary canal, of the ſtomach eſpecially; poiſons admitted into the body, particularly of the narcotic kind, as opium, wine, &c. and hence vertigo is a ſymptom of every kind of drunkenneſs. Various motions alſo, either of the head or the whole body, being toſſed in a ſhip, eſpecially if the veſſel be ſmall and the ſea runs high, produce a vertigo. In theſe and ſimilar examples, the unuſual and inordinate motions of the blood are communicated to the nervous parts which are in the head; or theſe being affected by ſympathy from the neighbouring parts, produce a confuſed ſenſation as if of a rotatory motion. Nay, it is often produced from an affection of the mind itſelf, as from beholding any thing turned ſwiftly round, or a great cataract, or looking down a precipice, or even by intenſe thought without looking at any thing.

Though a vertigo be for the moſt part a ſymptom and concomitant of other diſeaſes, yet it is ſometimes a primary diſeaſe, returning at intervals, increaſing gradually, and equally impeding and deſtroying the functions of the body and mind.

Internal Senſes.

83 Memory. After having treated of the external ſenſes, doctor Gregory next proceeds to conſider thoſe properly called *internal;* which are, the *memory*, the *imagination*, and the *judgment*. The firſt is leſſened, diſturbed, or even totally deſtroyed, in many diſeaſes, eſpecially thoſe which affect the brain; as the apoplexy, palſy, internal tumors of the head, external violence applied, fevers, eſpecially thoſe in which there is an increaſed motion of the blood towards the head, or where the brain is any other way much affected. It is very rarely, however, depraved in ſuch a manner that ideas are not repreſented to the mind in their proper order; or if at any time ſuch a diſorder occurs, it is conſidered rather as a diſorder of the imagination, or as a delirium, than a failure of the memory. The mind is ſaid to be diſordered when the perceptions of memory or imagination are confounded with thoſe of ſenſe, and of conſequence thoſe things believed to be now preſent which are really paſt or which never exiſted; or when the ſenſe of the perſon concerning ordinary things is different from that of other people. The general name for ſuch diſorders is *veſania:* if from fever, it is called *delirium.* A general fury without a fever, is called *mania*, or *madneſs:* but a partial madneſs, on one or two points, the judgment remaining ſound in all other reſpects, is called *melancholia.* There is, however, no exact and accurate limits between a ſound mind and madneſs. All immoderate vivacity borders upon madneſs; and, on the other hand, a ſorrowful and gloomy diſpoſition approaches to melancholy.

85 Delirium. Delirium accompanies fevers of many different kinds. Sometimes it is ſlight, eaſily removed, and ſcarce to be accounted a bad ſign. Often, however, it is very violent, and one of the very worſt of ſigns, requiring the utmoſt care and attention.

A delirium is either fierce or mild. The fierce delirium is preceded and accompanied by a redneſs of the countenance, a pain of the head, a great beating of the arteries, and noiſe in the ears; the eyes in the mean time looking red, inflamed, fierce, ſhining, and unable to bear the light; there is either no ſleep at all, or ſleep troubled with horrid dreams; the wonted manners are changed; an unuſual peeviſhneſs and ill-nature prevail. The depravation of judgment is firſt obſerved between ſleep and waking, and by the perſon's crediting his imagination, while the perceptions of ſenſe are neglected, and the ideas of memory occur in an irregular manner. Fury at laſt takes place, and ſometimes an unuſual and incredible degree of bodily ſtrength, ſo that ſeveral people can ſcarce keep a ſingle patient in his bed.

The mild delirium, on the contrary, is often accompanied with a weak pulſe, a pale collapſed countenance, and a vertigo when the patient ſits in an erect poſture; he is ſeldom angry, but often ſtupid, and ſometimes remarkably grieved and fearful. The loſs of judgment, as in the former kind, is firſt perceived when the patient is half awake; but a temporary recovery enſues upon the admiſſion of the light and the converſation of his friends. The patient mutters much to himſelf, and attends little to the things around him; at laſt, becoming quite ſtupid, he neither feels the ſenſations of hunger or thirſt, nor any of the other propenſities of nature, by which means the urine and excrements are voided involuntarily. As the diſorder increaſes, it terminates in ſubſultus tendinum, tremors, convulſions, fainting, and death. The other ſpecies of delirium alſo frequently terminates in this, when the ſpirits and ſtrength of the patient begin to fail.

The ſymptoms accompanying either of theſe kinds of delirium ſhow an unuſual, inordinate, and unequal motion of the blood through the brain, and a great change in that ſtate of it which is neceſſary to the exerciſe of the mental powers. It is ſufficiently probable, that an inflammation of the brain, more or leſs violent and general, ſometimes takes place, although the ſigns of univerſal inflammation are frequently ſlight. This we learn from the diſſection of dead bodies, which often ſhow an univerſal redneſs of the brain or of ſome of its parts, or ſometimes an effuſion or ſuppuration.

The ſtate of the brain, however, may be much affected, and a delirium induced, by many other cauſes beſides the motion of the blood. In many fevers, typhus, for inſtance, the nervous ſyſtem itſelf is much ſooner and more affected than the blood; and though the morbid affections of the nervous ſyſtem are as inviſible to the ſenſes as the healthy ſtate of it, the ſymptoms of its injuries plainly ſhow that its action, or *excitement* as ſome call it, is unequal and inordinate. In this way, too, a delirium is produced by ſeveral poiſons.

85
Melancholy and mania.

The pathology of melancholy and mania is much more obſcure; as coming on without a fever, or diſturbance in the blood's motion. Often alſo they are hereditary, depending on the original ſtructure of the body, eſpecially of the brain; the fault of which, however, cannot be detected by the niceſt anatomiſt. But it is well known, that various diſeaſes of the brain, obſtructions, tumours, either of the brain itſelf, or of the cranium preſſing upon it, any injury done to the head, and, as ſome phyſicians relate, the hardneſs and dryneſs of the brain, and ſome peculiar irritations affecting the nervous ſyſtem, are capable of bringing on this malady. And indeed ſo great are the irritations affecting the nervous ſyſtem in mad people, that they often ſleep little or none for a long time.—yet even this ſo defective and imperfect knowledge of the diſeaſes of the brain and nerves, is by no means free from difficulties. For though we know that the brain, or a certain part of it, is hurt, or that it is irritated by a ſwelling, or a pointed bone growing into it, nobody can foretel how great, or what may be the nature of the malady from ſuch a hurt: for examples are not wanting of people who, after loſing a large part of the brain, have recovered and lived a long time; or of thoſe who have perceived no inconvenience from a large portion of that viſcus being corrupted, until at length they have fallen ſuddenly down and died in convulſions.

86
Idiotiſm.

Another diſeaſe of the internal ſenſes, quite different from theſe, is *fatuity* or *idiotiſm*. Thoſe are called *idiots* who are deſtitute either of judgment or memory, or elſe have theſe faculties unequal to the common offices of life. A kind of idiotiſm is natural and common to all infants; neither is it to be accounted a diſeaſe: but if it laſts beyond the ſtate of infancy, it is a real diſeaſe, and for the moſt part incurable. It has the ſame cauſes with the other diſeaſes of the internal ſenſes: although theſe can ſcarcely be detected by the eye or by the knife of the anatomiſt. It frequently accompanies, or is the effect of, epilepſy. Hence, if the epilepſy derives its origin from cauſes not ſeated in the head, as from worms lodging in the inteſtines, the fatuity may be cured by diſlodging theſe, and removing the epilepſy. It is not unlikely that the fatuity of children, and the dotage of old men, may ariſe from the brain being in the former too ſoft and in the latter too hard.

87
Diſorders in the muſcular power.

The muſcular power may be diſeaſed in a great number of ways. The mobility itſelf may be too great; but this muſt be carefully diſtinguiſhed from vigour. By mobility is meant the eaſe with which the muſcular fibres are excited into contraction. The vigour, on the other hand, is that power with which the contraction is performed. They are ſometimes joined, but more frequently ſeparate, and for the moſt part the exceſſes of each are owing to contrary cauſes.

88
Mobility.

Too great mobility is when motions are excited by too ſlight a ſtimulus, or when too violent motions are produced by the cuſtomary ſtimulus. A certain habit of body, ſometimes hereditary, renders people liable to this diſeaſe. Women have a greater ſhare of mobility than men have. Infants have a great deal of mobility, often too great; youth has leſs than infancy, but more than man's eſtate; though old age has commonly too little. A lazy, ſedentary life, full diet, a ſuppreſſion of the uſual evacuations, fulneſs of the blood-veſſels, and ſometimes their being ſuddenly emptied, laxity, flaccidity of the ſolids in general, but ſometimes too great a tenſion of the moving fibres, the uſe of diluents, eſpecially when warm, or heat applied in any manner, produce too great mobility. And this may be either general or particular, according as the cauſes have been applied to the whole body or only to a part of it.

89
Vigour.

Vigour in general is rarely morbid; although ſometimes certain muſcular parts appear to have too great ſtrength. In maniacs and phrenitics, an immenſe ſtrength is obſerved in all the muſcles, eſpecially in thoſe that ſerve for voluntary motion; which is not unjuſtly reckoned morbid. The reaſon of this exceſs is very obſcure; however, it is plainly to be referred to a diſeaſed ſtate of the brain.

A more frequent and more important exceſs of vigour is obſerved in thoſe muſcular fibres that do not obey the will, ſuch as thoſe which move the blood. Its circulation is thus often increaſed, not without great inconvenience and danger to the patient. But a ſlighter exceſs of this kind, pervading the whole body, renders people apt to receive inflammatory diſeaſes, and is uſually called a *phlogiſtic diatheſis*. But this is better obſerved when local, as in inflammation itſelf.

Too great vigour of the muſcular fibres may ariſe from the nervous power increaſed beyond meaſure, as in mania, phrenitis, or violent affections of the mind; from too great a tenſion of the fibres, by which they more eaſily and vehemently conceive motions, as of the arteries when filled with too much blood; from catching cold, by being expoſed either to cold or heat, as uſually happens in the ſpring; or laſtly, though the nervous power and tenſion of the fibres ſhould not at all be changed, their action may become too great, from a ſtimulus more violent than uſual being applied, or from the uſual ſtimulus if the fibres themſelves have already acquired too great a ſhare of mobility.

90 **Torpor.** The oppoſite to too great mobility is torpor, and to too great vigour is debility. Torpor is ſuch a diminution of mobility as renders the parts unequal to their functions. It ariſes from cauſes directly oppoſite to mobility; ſuch as, in the firſt place, a harder and more rigid contexture of the parts themſelves, or even ſometimes from one too lax and flaccid; from old age; from ſome peculiar temperament of body, ſuch as one phlegmatic, frigid, or inſenſible; too great and inceſſant labour, cold, ſpare diet, and an exhauſted body. This evil is the more to be dreaded, becauſe, the powers of the body being deficient, nature is neither able to make any effort of herſelf, nor are the remedies, in other caſes the moſt efficacious, capable of affording her any aſſiſtance.

91 **Debility.** Debility takes place, when the motion of the muſcles, either voluntary or involuntary, is not performed with ſufficient ſtrength. A greater or leſſer ſhare of debility, either general or of ſome particular part, accompanies almoſt all diſeaſes, and is indeed no ſmall part of them: for it is hardly poſſible that a diſeaſe can ſubſiſt for any length of time without inducing ſome degree of debility. When a ſtate of debility is induced, it renders a man obnoxious to innumerable diſorders, and throws him as it were defenceleſs in their way. It often depends on the original ſtructure of the body, ſo that it can be corrected neither by regimen nor medicines of any kind. A different degree of ſtrength alſo accompanies the different ages of mankind; and thus, in ſome caſes, debility cannot be reckoned morbid. But a truly morbid and unwonted debility ariſes from the nervous force being diminiſhed; from diſeaſes of the brain and nerves, or of the muſcles through which they are diſtributed; from a decay of the nerves themſelves; from a want of the due tenſion of the fibres, or the fibres themſelves becoming torpid; from the body exhauſted by ſpare diet, want, evacuations; or laſtly, from diſeaſes affecting the whole body, or ſome particular parts of it.

92 **Palſy.** The higheſt degree of debility, namely, when the ſtrength of the muſcles is altogether or nearly deſtroyed, is called *paralyſis* or *palſy;* and is either univerſal, or belonging only to ſome particular muſcles. An univerſal palſy ariſes from diſeaſes of the brain and nerves, ſometimes very obſcure, and not to be diſcovered by the anatomiſt; for the nervous power itſelf is often deficient, even when the ſtructure of the nerves remains unhurt: yet often a compreſſion, obſtruction, or injury of the veſſels, extravaſation of blood, or ſerum, collections of pus, ſwellings, &c. are diſcovered. It frequently ariſes from certain poiſons acting on the nerves; from the fumes of metals; from the diſeaſes of parts, and affections of the muſcles, very remote from the brain, as in the colic of Poictou. A palſy of ſingle muſcles, but leſs perfect, often ariſes without any defect of the brain or nerves, from any violent and continued pain, inflammation, too great tenſion, relaxation, reſt, or deſtruction of the contexture of the parts, ſuch as commonly happens after the rheumatiſm, gout, luxations, fractures of the bones, and iſchuria.

An *univerſal* palſy, however, as it is called, ſeldom affects the whole body, even though it ſhould originate from a diſeaſe of the brain. We moſt commonly ſee thoſe who are paralytic affected only on one ſide, which is called an *hemiphlegia*. It is ſaid that the ſide of the body oppoſite to the diſeaſed ſide of the brain is moſt commonly affected. If all the parts below the head become paralytic, it is called a *paraplegia*. In theſe diſeaſes the ſenſes for the moſt part remain; though ſometimes they are aboliſhed, and at others rendered dull. Sometimes, though rarely, and which is an exceeding bad ſypmtom, the motion, ſenſation, pulſe, and heat of the paralytic limbs are loſt; in which caſe the arteries themſelves become paralytic. A palſy of the whole body, as far as regards the voluntary motions, with anæſthesia and ſleep, is called an *apoplexy*. This proceeds from ſome injury of the brain: though a ſtate very ſimilar to it is induced by narcotics, opium, wine itſelf, or any generous liquor taken to exceſs; and laſtly, by breathing in air corrupted by noxious impregnations, ſuch as a large proportion of carbonic acid, hydrogenous, gas, or any ſimilar active aeriform fluid.

93 **Spaſm.** Another diſeaſe to which muſcular motion is liable, and that neither ſlight nor unfrequent, is called *ſpaſm*. This is a violent and irregular motion of the muſcles. Of ſpaſms there are two kinds, the tonic and clonic. The latter is frequently called a *convulſion;* in order to diſtinguiſh it from the other, which is more peculiarly called *ſpaſm*.

Spaſm therefore is a violent, conſtant, and preternatural contraction of the muſcular fibres; but a convulſion is an unuſual and violent contraction alternated with relaxation. People are rendered liable to ſpaſm by too ſenſible an habit of body, or too great mobility; and hence it is a diſeaſe common in women, in infants, and in weak, luxurious, lazy, and plethoric people. It is brought on thoſe already prediſpoſed to it, by any kind of ſtimulus applied to the brain, or to any nerve, muſcle, or nervous part connected with it: of which we have examples in dentition; worms lodged in the inteſtines, and irritating them; any acrid matter infecting the blood, or much affecting the ſtomach and inteſtines; the irritation of any nerve, or of the brain itſelf, by an exoſtoſis, ſwelling, too great fulneſs of the veſſels, pain, vehement affections of the mind, ſudden evacuation, or poiſons admitted into the body. Frequently, however, the malady originates from ſlight cauſes, little known, and not eaſily obſerved.

Spaſm is both the cauſe and effect, and frequently conſtitutes the greateſt part, of moſt diſeaſes. It is often very difficult either to be known or cured; becauſe it is ſo multiform, and produces as many different ſymptoms as there are organs affected; of which it ſurpriſingly diſturbs, impedes, or increaſes the functions. It is a diſeaſe ſeated in the original ſtamina of the conſtitution; and neither to be removed by ſlight remedies, nor in a ſhort time.

94 **Sleep.** With regard to ſleep, Dr Gregory obſerves, that its uſe is ſufficiently apparent from the effects which it produces in the body. It reſtores the powers both of mind and body when exhauſted by exerciſe, giving vigour to the one, and reſtoring its wonted alacrity to the

Diſorders of Sleep.

the other. It renders the muſcles again active and moveable, after they have become wearied, rigid, painful, and trembling by hard labour. It moderates the quickneſs of the pulſe, which uſually increaſes at night, and brings it back to its morning ſtandard. It ſeems alſo to aſſiſt the digeſtion of the aliment; leſſens both the ſecretions and excretions; and renders the fluids thicker than otherwiſe they would be, eſpecially in a body endowed with little ſenſibility or mobility. Hence ſleep is not only uſeful, but abſolutely neceſſary for preſerving life and health; and is a moſt excellent remedy both for alleviating, and totally removing, a great many diſeaſes.

Want of ſleep is hurtful in a great many different ways, eſpecially to the nervous ſyſtem. It renders the organs of ſenſe both external and internal, as well as thoſe of every kind of motion, unfit for performing their offices. Hence the ſenſations are either aboliſhed, or become imperfect or depraved; and hence imbecility of mind, defect of memory, a kind of delirium, mania itſelf, pain of the head, weakneſs of the joints, an imperfect or inordinate action of the vital organs, quickneſs of pulſe, heat, fever, depraved digeſtion, atrophy, leanneſs, and an increaſe or perturbation of the ſecretions and excretions.

Sleep may be prevented both in healthy and ſick people from various cauſes; ſuch as ſtrong light, noiſe, pain, anger, joy, grief, fear, anxiety, hunger, thirſt, vehement deſire, motion of the body, memory, imagination, intenſe thought, &c. On the other hand, ſleep is brought on by a ſlight impreſſion on the organs of ſenſe, or none at all; by the humming of bees, the noiſe of falling water, cold and inſipid diſcourſe; or laſtly, by ſuch an exerciſe of the memory as is neither too laborious nor diſturbing to the mind.—Too great an impulſe of the blood towards the head, ſuch as often happens in fevers, prevents ſleep; but a free and equal diſtribution of the blood through the whole body, eſpecially the extreme parts, frequently brings it on. Whatever weakens the body alſo favours ſleep; and hence various kinds of evacuations, the warm bath, fomentations, ſometimes heat itſelf, are uſeful for promoting it. It alſo comes on eaſily after taking food, or indulging venery, the violent ſenſation being then quieted, and the body itſelf ſomewhat weakened. Cold produces a deep ſleep of long continuance, not eaſily diſturbed, and often terminating in death. Laſtly, there are certain ſubſtances which, when applied to the body, not only do not excite the nervous ſyſtem, but plainly lay us aſleep, and render us unfit for ſenſation: of this kind are thoſe called *narcotics*, as opium and the like; among which alſo we may reckon wine taken in too great quantity. Laſtly, watching itſelf is often the cauſe of ſleep; becauſe while a man is awake he always more or leſs exerciſes the organs of his body, by which the nervous influence is diminiſhed, and thus the more violently the body is exerciſed, in the ſame proportion is the perſon under a neceſſity of ſleeping.

Sleep is deficient in many diſeaſes; for there are few which do not excite pain, anxiety, or uneaſineſs, ſufficient to prevent the approach of ſleep, or to diſturb it. Fevers generally cauſe thoſe who labour under them to ſleep ill; as well on account of the uneaſineſs which accompanies this kind of diſeaſes, as by reaſon of the impetus of the blood towards the head being frequently increaſed; and likewiſe from the ſtomach being diſordered, loaded with meat, or diſtended with drink. Hence alſo we may ſee the reaſon why many hypochondriac and hyſteric patients ſleep ſo ill: becauſe they have a bad digeſtion, and their ſtomach is diſpoſed to receive many though frequently ſlight diſorders; the ſlighteſt of which, however, is ſufficient to deprive the patient of reſt, provided the body be already irritable, and endowed with too great a ſhare of mobility.

Want of ſleep will hurt in diſeaſes as well as in health; and for the ſame reaſon; but in a greater degree, and more quickly, in the former than in the latter; and is therefore not only a very troubleſome ſymptom of itſelf, but often produces other very dangerous ones.

Too much ſleep, on the other hand, produces many miſchiefs, rendering the whole body weak, torpid, and lazy; and it even almoſt takes away the judgment. It alſo diſturbs the circulation, and diminiſhes moſt of the ſecretions and excretions. Hence plethora, fatneſs, flaccidity, and an inability for the common offices of life.—The cauſes of this exceſs are, either the uſual cauſes of ſleep abovementioned increaſed beyond meaſure, or ſome fault in the brain, or a compreſſion of it by an extravaſation of the humours; or ſometimes, as it would ſeem, from great debility produced by an unuſual cauſe, as in thoſe who are recovering from typhous fevers and other diſeaſes. In thoſe examples, however, this exceſs of ſleep is by no means hurtful; nor even, perhaps, in theſe caſes where an exceſs of grief continued for a long time, or a great fright, have produced a ſurpriſing and unexpected ſomnolency. Laſtly, many people have accuſtomed themſelves, and that not without a great deal of hurt to their conſtitutions, to ſleep too much. Nor are there examples wanting of ſome who have paſſed whole days, and even months, in ſleep almoſt uninterrupted.

95 Circulation.

With regard to the manner in which the circulation of the blood is performed, and the various principles of which it is compoſed, ſee the articles BLOOD, and ANATOMY. As for the diſorders to which the blood and its circulation are ſubject, Dr Gregory obſerves, that in our younger years the veins are much more denſe, firm, and ſtrong, than the arteries; but the latter, by reaſon of the continual preſſure upon them, and the ſtrength which they exert, become daily more firm, hard, and ſtrong, until at laſt they equal or exceed the veins themſelves in ſtrength; and it is not uncommon in old men to find ſome part of the arteries converted into an horny ſubſtance, or even into a ſolid bone. Hence in the ſtate of infancy the greateſt part of the blood is contained in the arteries, and in old age in the veins; an affair indeed of no ſmall moment, as it ſhows the reaſon in ſome meaſure of the ſtate of increaſe and decreaſe of the body. Beſides, if any diſeaſe happens from too great a quantity of blood, it thence appears that it muſt ſhow itſelf in young ſubjects in the arteries, and in old ones in the veins; and this is the reaſon of many diſeaſes which accompany certain periods of life.

In moſt, if not in all ſpecies of animals, the arteries of the females are much more lax and capacious when compared with the veins, and the veins much leſs, than in the males of the ſame genus. The deſign of nature in this conformation, is probably that they may be the better able to nouriſh the fœtus in their womb. The ſame likewiſe ſeems to be the reaſon why women are more inclined to plethora than men; and to this greater capacity of the arteries and ſmallneſs of the veins are we to aſcribe that beauty and elegant ſhape of the arms in women, not disfigured or livid with veins as in men.

The blood is alſo diſtributed in various proportions to the different parts of the body, and that proportion too differs at different periods of our lives. At firſt an immenſe quantity is ſent to the head, becauſe that part of the body is firſt to be evolved and fitted for its offices: but as ſoon as the parts begin to make a conſiderable reſiſtance to the efforts of the blood, and the veſſels cannot eaſily be further dilated, it is neceſſarily ſent off to other parts; by which means the reſt of the body increaſes in bulk, and becomes fitted for performing its proper functions. The effect of this change is alſo very ſoon obſerved, namely, when none of the blood paſſes through the navel, and of conſequence a greater quantity is ſent by the iliac arteries to the inferior extremities. Theſe, though ſo ſmall and ſlender in the fœtus, increaſe very ſuddenly; ſo that often in not many months the child can not only ſtand on its feet. but even walk tolerably well.

96 Pulſation of the arteries.

Phyſicians are wont to judge of the ſtate of the circulation by the pulſe; which indeed is very various, as well with regard to its frequency, as to the ſtrength and equality of its ſtrokes and intervals.—Its common quickneſs in a healthy grown-up perſon is about 70 ſtrokes in a minute. In a fœtus, perhaps, it is more than double; and in an infant a few months old, hardly leſs than 120. As we grow up, this quickneſs gradually diminiſhes; ſo that in extreme old age it ſometimes does not exceed 50, or is even ſlower. This rule, however, is not without exceptions: for many, eſpecially thoſe of an irritable habit, have the pulſe much quicker; while others, even in the vigour of their age, have the pulſe remarkably ſlow. It is for the moſt part ſomewhat quicker in women than in men.

The pulſe is alſo rendered quicker, both in a healthy and diſeaſed body, by the application of ſtimuli of many different kinds. Exerciſe eſpecially, by accelerating the return of the blood through the veins, increaſes the quickneſs of the pulſe to a ſurpriſing degree. Various kinds of irritations affecting the nervous ſyſtem, as intenſe thinking, paſſions of the mind, pain, heat, ſtimulating medicines, wine, ſpices, &c. likewiſe produce the ſame effect. The acrimony of the blood itſelf alſo is thought to quicken the pulſe.

When a perſon firſt awakes in the morning, the pulſe is ſlow, but becomes quicker by degrees on account of the many irritating matters applied to the body. Its quickneſs is increaſed after taking food, eſpecially of the animal kind, or ſuch as is hot or ſeaſoned with ſpices. In the evening a ſlight fever comes on, for which reſt and ſleep are the remedy. Theſe things, however, are ſcarce to be obſerved in a healthy perſon, but are very evident in one that is feveriſh, eſpecially when the diſeaſe is a hectic.—Again, even debility itſelf often renders the pulſe quicker than uſual; becauſe the ventricle of the heart not being quite emptied, it is the ſooner dilated again, and of conſequence contracts the ſooner. For this reaſon a phyſician can never judge of the ſtrength of the circulation from the frequency of the pulſe.

Laſtly, in all fevers, however different from one another, the pulſe is found to be too quick, partly perhaps from debility, partly from the acrimony of the fluids, and partly from the repulſion of the blood from the ſurface of the body, and the accumulation of it in the large veſſels where it acts as a ſtimulus; though it muſt be owned, that a great deal of this is obſcure, if not totally unknown; nor in truth are we able to underſtand in what manner the *autocrateia* acts with regard to the frequency of the pulſe.

The pulſe is ſeldom obſerved too ſlow, unleſs when the mobility of the body is much diminiſhed, as in decrepid old age, or from a compreſſion or diſeaſe of the brain; but a greater compreſſion of the brain uſually produces a ſtill more remarkable ſlowneſs of the pulſe, as in the hydrocephalus, apoplexy, &c.—Sometimes alſo the pulſe is too ſlow in thoſe who are recovering from tedious fevers. But this is a matter of little moment, and ſeems to be owing to ſome kind of torpor. Indeed it has generally been conſidered as a mark of a thorough and complete ſolution of the fever; for it is commonly obſerved, that when this ſtate of the pulſe takes place, the patient ſeldom ſuffers a relapſe.

While the frequency of the pulſe continues the ſame, its ſtrokes may be either full, great, ſtrong, and hard; or ſoft, ſmall, and weak. A full, great, and ſtrong pulſe takes place when the ventricle ſtrongly and completely empties itſelf; throwing out a greater quantity of blood into the arteries, which fully diſtends them and ſtimulates them to a ſtrong contraction. A pulſe of this kind is common in ſtrong healthy men, and is ſeldom to be accounted a ſymptom of diſeaſe. But if it be too ſtrong, and ſtrike the finger of the perſon who feels it violently and ſharply, it is called a *hard pulſe*. This hardneſs is produced by a ſudden and violent contraction of the heart and arteries, which diſtends even the remote branches, as thoſe of the wriſt, too ſuddenly and ſmartly, and excites them alſo to ſudden and violent contractions.

A hard pulſe therefore denotes too great an action of the heart and arteries. It may ariſe from various cauſes: in the firſt place, from too great a tenſion of the veſſels; for inſtance, from their being too full, and by that means more prone to motion, and the more fit for receiving violent motions. It may ariſe alſo from too great a denſity and firmneſs of the ſolids; and hence it is moſt frequent in cold countries, among ſtrong robuſt people, and ſuch as are accuſtomed to hard labour. It may likewiſe ariſe from various cauſes irritating the whole nervous ſyſtem, or only the heart and arteries. Laſtly, it accompanies many fevers, as well as moſt inflammatory diſorders, whether the inflammation ariſes from a general ſtimulus applied to the whole body, or from the irritation of particular parts, by degrees extended over the whole body. In ſuch a ſtate of the circulation, the patient frequently ſtands in need of blood-letting, and almoſt always bears it well.

A ſmall, weak, and ſoft pulſe is generally owing to cauſes oppoſite to the foregoing, and indicates a contrary ſtate of the circulation and nervous ſyſtem. It frequently requires ſtimulants; nor does it generally require blood-letting, or eaſily bear it. Sometimes, however, a pulſe of this kind is obſerved even in the caſe of a dangerous inflammation, of the ſtomach for inſtance, or inteſtines. But in theſe and the like examples, we ought to attend to the nature of the malady, much more than to the ſtate of the pulſe.

The pulſe is ſaid to intermit, when the ſtroke does not return after the uſual interval, and perhaps not till after twice, thrice, or four times the uſual ſpace. A pulſe of this kind ſeems to be almoſt natural and conſtant in ſome animals, and is common to ſome men even in the moſt perfect health; and if theſe happen to be ſeized with a fever, the pulſe ſometimes becomes equal, nor can the diſeaſe be removed before the intermiſſion has returned.

Moreover, in ſome people, though their pulſe beats equally while in health, yet the ſlighteſt illneſs makes it intermit; and in others, eſpecially thoſe who have a great deal of mobility in their conſtitution, ſuch as hypochrondriac and hyſteric people, the intermiſſion of the pulſe is felt, without applying the finger to the artery, merely by the uneaſineſs which they perceive in their breaſts during thoſe intervals in which the pulſe is deficient. An intermittent pulſe likewiſe occurs in many diſeaſes of the breaſt, eſpecially when water is collected in it; and the like happens in the end of all diſeaſes, eſpecially fevers, when the ſtrength is nearly exhauſted, and death approaches, of which it is frequently the forerunner.

An intermitting pulſe therefore ſeems to ariſe from an unequal influx of the nervous power into the heart, or from the decay and exhauſtion of the nervous power, by which means the heart is not able to contract till it has been diſtended beyond its due pitch. Or laſtly, it may ariſe from diſeaſes of the organ itſelf, or the neighbouring parts; from ſwellings, water, &c. preſſing upon them, and impeding the action of the heart: which indeed is a very dangerous diſorder, and almoſt always mortal.

Many other variations of the pulſe are enumerated by phyſicians, but moſt of them uncertain, and not confirmed by experience. We ſhall therfore now conſider the motion of the blood, which may be either too great, too ſmall, or irregular.

A quick pulſe, *cæteris paribus*, produces a more rapid circulation, becauſe the ſooner that the ventricle of the heart is emptied, the more quickly is the blood thrown into the arteries; and their actions muſt anſwer to this ſtronger ſtimulus. Hence exerciſe, heat, ſtimulants, plethora, every kind of irritation, paſſions of the mind, and fever, increaſe the circulation. The effect of this increaſe is a diſtenſion of the veſſels, a ſtimulus applied to the whole body, an increaſe of heat, and often a debility. The ſecretion of ſweat is increaſed while the other ſecretions are diminiſhed, and the various functions of the body impeded; thirſt comes on, the appetite is loſt, the fat conſumed, and a diſpoſition to putreſcency introduced. Sometimes the ſmaller veſſels are burſt; whence effuſions of blood and hæmorrhages. But we are by no means to forget, that this violent motion of the blood, however hurtful it may ſeem, is among the beſt remedies made uſe of by nature in curing many diſeaſes.

The motion of the blood is diminiſhed, eſpecially by debility, torpor, the want of irritation or of exerciſe: the ſame thing happens to all the humours, if there be any obſtruction in the veſſels, or any cauſe by which their return is hindered or rendered more difficult. Thus, from the very weight of the blood itſelf, if a perſon has ſtood long on his feet, the humours return more ſlowly from the inferior extremities. Any diſeaſe of the heart and arteries alſo, as an aneuriſm, contraction, oſſification, muſt neceſſarily obſtruct the circulation. The ſame thing happens from obſtructions of the veins, or interrupted inſpiration, by which the paſſage of the blood through the lungs to the left ſide of the heart is impeded.

But, from whatever cauſes this diminution of the circulation takes place, the bad conſequences are perceived chiefly in the veins, becauſe in them the blood always moves more ſlowly than in the arteries. Hence varices, and congeſtions of blood, eſpecially in thoſe parts of the body where the veins are deſtitute of valves, and of conſequence where the motion of the muſcles cannot aſſiſt the circulation. Hence alſo ariſe dropſies from an impeded or languid motion of the blood; becauſe the reſiſtance of the veins being increaſed, the blood is received into them with the greater difficulty, and more of the thin humour is driven into the exhaling veſſels, and by them depoſited in ſuch quantities as cannot be reabſorbed by the lymphatics. Theſe diſeaſes, as well as all others proceeding from defects of the circulation, are alſo more difficult of cure than others, becauſe all the vital powers are weakened at the ſame time.

Another diſorder of the circulation is where the blood is carried to one part of the body in too great quantity, by which means the other parts are deprived of their due proportion. This irregular diſtribution of the vital fluid frequently ariſes from a ſtimulus applied to the part itſelf, or to the brain, or at length acting on the mind, which, according to the laws of ſympathy, produces a certain and definite diſtribution of the blood. It ariſes alſo not unfrequently from a ſpaſm taking place in ſome other parts, which drives the blood out of its ordinary courſe.

In proportion to this irregularity of the circulation are the conſequences; heat, ſwelling, redneſs, inflammation, ruptures of veſſels, hæmorrhages, effuſions, deſtruction, corruption, and ſuppuration of the cellular texture and adjoining parts, &c. Even this evil, however, nature often converts into an excellent remedy; and phyſicians, following her ſteps, frequently attempt to direct the diſtribution of the blood in particular diſeaſes, well knowing that a change in the diſtribution in the blood is frequently efficacious either for radically curing ſome diſeaſes or relieving their moſt urgent ſymptoms.

97
Palpitation

Laſtly, ſome diſorders in the motion of the heart itſelf, and thoſe of no ſmall conſequence, remain yet to be taken notice of, namely, palpitation and ſyncope. A palpitation is a violent and irregular action of the heart, ſuch as for the moſt part is perceived by the patient himſelf, and that not without a great deal of uneaſineſs and oppreſſion at his breaſt; and is alſo manifeſt to the by-ſtanders if they apply their hands, or look

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look at his naked breaſt; the pulſe of the arteries in the mean time being weak, unequal, and intermitting. This is a ſpaſmodic diſorder; and is induced by various cauſes affecting either the nervous ſyſtem in general, or the heart in particular. Every diſeaſe of the organ itſelf, ſuch as a conſtriction of its valves and blood-veſſels, and oſſification, enlargement, or polypus, hindering the free action of the heart, and evacuation of blood from it, are capable of exciting it to violent and unuſual contractions. The ſame effect will alſo follow plethora, or too violent an impulſe of the blood, &c. The heart will likewiſe frequently palpitate from a violent excitement of the nervous ſyſtem, eſpecially where the conſtitution is endowed with a great deal of mobility. Hence palpitations from any affection of the mind, and in hyſteric women. Palpitation may likewiſe ariſe from an affection of the ſtomach, occaſioned by worms, a ſurfeit, flatus, or ſtimulation by various acrid ſubſtances. It frequently alſo accompanies the gout when driven back, or even when a fit is coming on. Sometimes it ariſes from debility, whatever may be the cauſe; frequently from any difficulty in breathing; and many of theſe cauſes may be joined at the ſame time, or ſome of them produce others.

Hence we may ſee why the evil is ſometimes ſlight and of ſhort continuance; at other times altogether incurable, and certainly mortal in a long or ſhorter time; why it ſometimes returns at intervals, often coming on and being increaſed by every kind of irritation and exerciſe, and ſometimes relieved or totally removed by ſtimulants or exerciſe.

98 Syncope.

A ſyncope is when the action of the heart, and, along with it, that of the arteries, is ſuddenly and very much leſſened; whence the animal-powers, the ſenſes, and voluntary motions, immediately ceaſe. This may be produced by almoſt all the cauſes of palpitation; becauſe whatever can diſturb and diſorder the motion of the heart, may alſo weaken or ſuſpend it. The vitiated ſtructure of the heart itſelf therefore, violent paſſions of the mind, whether of the depreſſing kind, or thoſe which ſuddenly and vehemently excite, various kinds of nervous diſeaſes, thoſe of the ſtomach, every kind of debility and evacuation, eſpecially a great loſs of blood, exceſſive and unremitting labour, long watching, heat, pain, many kinds of poiſons, &c. produce fainting.

Hence we ſee, that whatever weakens the motion of the blood through the brain tends to produce fainting; and, on the contrary, whatever tends to augment that motion, alſo tends to refreſh, and prevent the perſon from fainting. Hence alſo we ſee how the mere poſture of the body may either bring on or keep off fainting, or remove it after it has already come on. We likewiſe ſee how this diſorder may ſometimes be of little conſequence and eaſily removed; at others very dangerous, not only as a ſymptom, but in even itſelf, as ſometimes terminating in death; and laſtly, how it may be uſed as a remedy by a ſkilful phyſician, and artificially induced, either to free the patient from violent pain, or to ſtop an immoderate effuſion of blood ſcarce to be reſtrained by any other method.

99 Buff-coloured cruſt on the blood.

With regard to the diſorders of the blood itſelf, Dr Gregory obſerves, that the glutinous part of it produces that buff-coloured appearance often ſeen upon blood drawn from people afflicted with inflammatory diſorders, and even ſometimes when no ſuch diſeaſes are preſent. This cruſt indeed is nothing elſe than the pure gluten of the blood taking longer time than uſual to coagulate, by which means the red particles have an opportunity of falling to the bottom. This indicates no lentor, denſity, thickneſs, or tenacity of the blood, as was formerly thought; but rather its thinneſs, or at leaſt a leſs tendency in it to coagulate. It ariſes for the moſt part from a violent agitation and conquaſſation of the blood within the body: and hence it accompanies many fevers, all inflammations, ſometimes hæmorrhages, exanthemata, plethora, pain, and many irritations. It muſt however be allowed, that in ſeveral of theſe diſeaſes it is rendered highly probable, at leaſt from experiments apparently accurate, that the quantity of the gluten of the blood is really encreaſed in the proportion which it bears to the other parts. This cruſt, however, is not always to be accounted morbid, as it often happens to the moſt healthy; and may even be produced or deſtroyed by the ſlighteſt cauſes while the blood is running from the vein, ſo that frequently we ſhall ſee a very thick and tenacious cruſt on the blood flowing into one cup, while that which runs into another has little or none at all. In general, however, the appearance of this cruſt ſhows, that the patient will bear blood-letting well, though thoſe have been in a great miſtake who directed this operation to be repeated till no more cruſt appeared on the blood.

Diſorders of the Blood.

The glutinous part of the blood alſo frequently produces thoſe maſſes called *polypi*, which ſometimes take place during life, but more frequently after death, in the large veſſels near the heart, or even in the cavities of that organ. Similar maſſes alſo are frequently formed in the uterus, and are called *moles*.

100 Plethora,

The quantity of blood contained in a healthy body is very various, and difficult to be aſcertained. Many diſeaſes, however, may ariſe from its being either too ſcanty or too abundant. Too great a quantity of blood is produced by the uſe of rich nouriſhing diet, ſtrong drink, accompanied with a good digeſtion; from a lazy, ſedentary life, or much ſleep, eſpecially in thoſe who have been formerly accuſtomed to much exerciſe; with many other cauſes of the ſame kind. It renders the perſon dull, weak, and languid, and ſometimes almoſt totally oppreſſes him; nor are thoſe organs deſtined for moving the blood ſufficient for driving forward ſuch a load. The pulſe ſinks; and ſometimes a ſyncope, vertigo, or palpitation takes place. More frequently, however, the veſſels are too much diſtended, and ready to be thrown into violent and irregular motions. Hence a diſpoſition to fevers, inflammations, an unequal diſtribution of the blood, unuſual congeſtions, rupture of the veſſels, and hæmorrhages. Moreover, by reaſon of the cloſe connection between the ſanguiferous and the nervous ſyſtem, a fulneſs of blood produces a diſpoſition to ſpaſm and other diſeaſes of that kind.

Hence we may underſtand why a plethora is ſometimes accompanied with a weak and ſometimes with a ſtrong and hard pulſe, why it is the cauſe as well as a part of ſo many diſtempers, why it is the effect of a high ſtate of health, &c.

The

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Inanition.

The want of a due quantity of blood is no leſs pernicious than too great an abundance of it. It debilitates the perſon, and renders him unable to perform the proper offices of life; produces a languid circulation, ſyncope, ſpaſm, and at laſt death itſelf. In a ſlighter degree of the diſeaſe the body is emaciated through want of nouriſhment, and its functions are vitiated in various ways. It may ariſe from want, bad food, or ſuch as affords little nouriſhment: from bad digeſtion, or the chyle being hindered from paſſing into the blood; from fevers, or other diſeaſes which exhauſt the body and hinder nutrition: or laſtly, from various evacuations, particularly of blood: and that the more eſpecially if they are ſudden, for in ſlow evacuations the veſſels accommodate themſelves ſurpriſingly to the quantity left in them. Beſides, if the body be ſlowly exhauſted, the excretions are leſſened by reaſon of the deficiency of the vital power; ſo that the unuſual expence is eaſily compenſated by the unuſual retention. But if the evacuation happens to be very ſudden and great, it may either prove mortal in a ſhort time, or break the conſtitution to a degree beyond recovery.

101
Morbid thinneſs of the blood.

By a great and long continued deficiency of blood the quality of it alſo is impaired; becauſe the thin part of it is eaſily and ſoon made up; but the glutinous, thick, and red part, not ſo eaſily. Hence the blood becomes thin, pale, ſcarce capable of coagulation, or of affording a proper ſupport to the body. Too great thinneſs of the blood alſo proceeds from uſing much drink, eſpecially of the aqueous kind, ſlender and little nouriſhing diet, a bad digeſtion in the ſtomach; from diſeaſes of the lungs and thoſe organs which elaborate the red part; or from ſuppreſſions of the uſual evacuations of thin humours, as ſweat or urine, induced by cold, a fault of the ſecreting organs, or by putreſcency. But along with this other diſorders of the blood concur.

A too thin and watery blood makes the face pale, the body weak, languid, and torpid; the ſolid parts become flaccid from want of nouriſhment, and having too great a quantity of water in their compoſition. It brings on hydropic effuſions of water in all parts of the body, by reaſon of the increaſed exhalation of that thin fluid which moiſtens all the inward parts; partly by reaſon of the blood itſelf being in ſome meaſure diſſolved, ſo that it paſſes out of the veſſels more eaſily and plentifully than it ought to do; and partly by reaſon of the veſſels being relaxed beyond their uſual pitch, and not making a proper reſiſtance. Beſides, in this caſe, the lymphatics are ſo far from abſorbing more than uſual, that, partaking likewiſe of the general debility, they are ſcarce ſufficient for performing their proper offices.

Nature, however, has taken care, by the moſt ſimple means to provide againſt ſo many and ſo great evils; for neither does the blood ſo eaſily become thin as ſome have imagined, nor when this quality takes place does it want a proper remedy. For almoſt inſtantly, if the perſon be otherwiſe in health, the excretions of the thinner matters are greatly augmented, and the whole maſs of blood in a ſhort time becomes as thick as formerly.

[102]
Morbid thickneſs of the blood.

The oppoſite to this, namely, too great a thickneſs of the blood though often ſpoken of by phyſicians, is very rarely if ever obſerved; and thoſe fevers and inflammations which have been thought to ariſe from thence, are now found to originate from other cauſes. The following would ſeem to be the law of the human conſtitution. As ſoon as the blood has attained the due degree of thickneſs, or gone in the leaſt beyond it, the excretions are either increaſed or diminiſhed, the body attracts more moiſture from the air, the perſon is thirſty, and drinks as much as is neceſſary for diluting the blood. But if water be wanting, and the perſon cannot ſatisfy his thirſt, the blood is ſo far from being thickened, that by reaſon of a putreſcency begun or augmented, it is much diſſolved, becomes acrid, and is with difficulty contained in the veſſels.

103
Acrimony of the blood.

The acrimony of the fluids has afforded a large field for declamation to the ſpeculative phyſicians, and upon this ſlender foundation many perplexed and intricate theories have been built. It is certain indeed, that the blood in a ſtate of health has ſome ſmall ſhare of acrimony; and this acrimony, from certain cauſes, may be a little increaſed ſo as to produce various diſeaſes of a dangerous nature. This we are aſſured of from the increaſe of motion in the heart and arteries, and the ſimilar augmentation of the action of the ſecretory organs, from acrid ſubſtances taken inwardly. The ſame thing alſo appears from the unuſual acrimony of the ſecreted fluids in ſuch caſes, by which the veſſels are ſometimes greatly ſtimulated, and ſometimes even quite eroded. Very many acrid ſubſtances, however, are daily taken into the ſtomach; ſo that theſe muſt either be corrected in the *primæ viæ*, or changed by digeſtion before they paſs into the blood; or at leaſt by dilution with much water, or being blunted by an admixture with gluten, oil, or inflammable air, they muſt depoſit much of their acrimony, and at laſt be thrown out of the body as noxious ſubſtances. Thus a vaſt quantity of ſalts, acid, alkaline, and neutral, may paſs through the body, without in the leaſt affecting the health; though theſe ſalts, if taken in very large quantity, undiluted, or not thrown out of the body, will do much hurt.

Moreover, even while life continues, putrefaction is going on, and produces much of that ſubſtance called *animal* ſalt; for into this a great part of our food is converted, and paſſes off by the urine. But if this putreſcent diſpoſition be too great, it will produce too large a quantity of animal ſalt; eſpecially if much of any ſaline ſubſtance is otherwiſe thrown into the body without proper dilution; and this kind of diſeaſe is well known to ſailors who have been long at ſea without having any opportunity of getting freſh proviſions.

For this ſpontaneous putreſcency, nature has ſuggeſted a proper remedy, namely, freſh meat, eſpecially of the vegetable and aceſcent kind, and ſuch as is well impregnated with aerial acid, which it may impart to the body. But where this kind of food is wanting, the putrefaction goes on apace, and a very great thinneſs and acrimony of the juices take place; eſpecially if there be alſo a ſcarcity of water, or the excretions which ought to carry the putrid matters out of the body languiſh, either from cold, ſloth, torpor, depreſſing paſſions of the mind, or from the conſtitution being broken by diſeaſes: or laſtly, from too great heat, which always favours putrefaction.

Be-

Diſorders of the Blood.

Beſides, it would ſeem, that ſometimes a diſpoſition to putrefaction is much increaſed by the reception of a putrid ferment into the body; of which we have examples in ſome infectious fevers, where the contagion is very much aſſiſted by heat, animal-diet, certain kinds of ſalts, debility and naſtineſs.

Laſtly, any ſingle part of the body may putrefy from various cauſes, as from inflammation, gangrene, cold, &c. and thus may the whole body be infected; although for the moſt part the diſeaſe proves fatal before the corruption has ſpread over the whole body.

But when the maſs of blood begins to putrefy greatly, it not only becomes very acrid, but thin alſo, ſo that it either will not coagulate at all, or ſhows only a ſlight and very looſe craſſamentum. Nay, even the red globules are broke down and deſtroyed; in which caſe it neceſſarily follows, that the blood muſt become very acrid, as well on account of the evolution of the ſalt, as by reaſon of the rancid and putrid gluten, which ſtimulates, and frequently even erodes, the veſſels; producing ſpots, firſt red, then livid and black, tumors, and ulcers ſcarce poſſible to be cured, without firſt removing the putreſcent diſpoſition of the humours. From the ſame cauſes proceed hæmorrhages from every part of the body, hardly to be reſtrained; a moſt intolerable fetor of the breath and all the excrements; the higheſt debility and laxity of the ſolids; the putrefaction acting as a poiſon to the nervous ſyſtem, and at length bringing on death.

An acrimony of the acid kind never takes place in the human blood, nor in any of the humours ſecreted from it; though one of them, namely the milk, turns acid ſpontaneouſly in a very ſhort time after it is drawn from the breaſt. Neither, indeed, does an alkaline acrimony ſeem ever to take place in the blood. Putreſcency indeed tends this way, and at laſt terminates in it; but ſcarcely while the perſon lives, though the nature of the urine, even while recent, ſeems to be but little diſtant from that of an alkali.

Many kinds of acrimony indeed may exiſt in the blood from too liberal an uſe of ſpices, wine, &c. but of theſe we know nothing certain. We well know, however, that the body is often infected with various kinds of morbid acrimony, which bring on many and dangerous diſeaſes, as the ſmall-pox, meaſles, cancers, lues venerea, &c. of which the origin and manner of acting are very little underſtood, though the effects are abundantly evident. In moſt caſes, nature has taken no leſs care to provide againſt the *acrimony* than againſt the too great *thickneſs* of the blood. Sometimes an antidote is afforded, either by the excitement of thirſt, that the acrid ſubſtance may be diluted with plenty of drink; or by increaſing the evacuations, that it may be thrown out of the body; or laſtly, by exciting various motions and actions of the vital powers, by which it may be either ſubdued, changed, rendered innocent, or expelled from the body by new and unwonted paſſages.

104 Reſpiration. With regard to reſpiration, Dr Gregory obſerves, that it may be obſtructed from various cauſes ſeated either in the lungs themſelves or the ſurrounding parts. But from whatever cauſe this obſtruction may ariſe, it undoubtedly produces all thoſe diſeaſes which proceed from an interrupted circulation. The lungs themſelves alſo being at length compreſſed, and not ſuffered to dilate ſufficiently, cannot throw off the vapour which ariſes from them; and hence they are frequently oppreſſed with moiſture. At the ſame time they are irritated, ſo that a greater quantity of mucus, and that of a thicker kind than uſual, is ſecreted; by which means the paſſages through which the air enters them are ſtopped up, and a violent cough at length throws off the load.

Diſorders of Reſpiration.

The reſpiration is alſo ſubject to ſome other diſorders, as a cough and ſneezing; which, though at firſt ſight they may ſeem very dangerous, are not deſtitute of uſe, and may even be reckoned among the moſt ſalutary attempts of nature to relieve the patient. Often, however, they are attended with danger, or very great uneaſineſs; namely, when they are either too violent or exerted in vain. At any rate, it is neceſſary for a phyſician to know the nature, cauſes, and effects, of theſe, that he may be enabled to promote them when neceſſary, to moderate them when too violent, and to ſtop them when noxious or to no purpoſe.

105 Cough. A cough is a violent, frequently involuntary, and ſonorous exſpiration, ſuddenly expelling the air with great force through the glottis ſomewhat contracted. The convulſion of the muſcles ſerving for exſpiration, gives a great force to the air, while the contraction of the glottis produces the ſound. It is often long continued, being repeated at certain intervals, during each of which the inſpiration is imperfect and obſtructed by reaſon of the contraction of the glottis. It is excited by any kind of acrid ſubſtance, either chemically or mechanically applied to thoſe paſſages through which the air enters. Theſe are lined with a membrane ſo exceedingly delicate and impatient of ſtimulus, that it cannot even bear the touch of the mildeſt ſubſtance, ſuch as a ſmall drop of water, without throwing the muſcles ſerving for exſpiration into a violent convulſion; the glottis at the ſame time contracting by means of the ſympathy between it and the neighbouring parts. Thus the air is thrown out with ſuch violence, that it drives the irritating ſubſtance along with it; and thus a cough becomes not only uſeful, but abſolutely neceſſary for the preſervation of life, as being able to free the lungs from every kind of irritating ſubſtance or foulneſs, which might ſoon bring on a ſuffocation. Hence a cough is almoſt an inſeparable companion of every inflammation of the lungs, as well as every difficulty in reſpiration; and even frequently accompanies the entrance of the pureſt air when the trachea and bronchiæ are excoriated, or become too ſenſible. Examples alſo are not wanting, where a violent and troubleſome cough has ariſen from an irritation of the nervous ſyſtem, or even of ſome particular part, of the ear, for inſtance, the ſtomach and inteſtines by worms, the liver by inflammation, &c.

Coughing may alſo be voluntarily excited, and may then be managed at pleaſure. Even when involuntary, it may be moderated, or ſuppreſſed, by a contrary effort: though a violent fit of coughing cannot by any means be reſiſted. When it is once excited, the cough goes on till the irritating ſubſtance be expelled, or the ſenſe of irritation aboliſhed, or perhaps overcome by a more uneaſy ſenſation than even the cough itſelf; af-

Diſorders of Reſpiration. ter which, the irritation again returning at a certain interval, the cough alſo comes on. Hence we are taught a method of allaying and quieting this moſt troubleſome malady, though frequently it is not in our power to remove the cauſe of it altogether.

A very violent cough is often dangerous. For by the retention of the breath, and the ſtrong efforts made in coughing, a great quantity of blood is collected in the lungs, of which the veſſels are diſtended, and frequently broken; and hence there ſometimes happens a violent and even fatal hemorrhage. More frequently, however, it is the cauſe of a ſlower, though equally fatal, diſeaſe. Nay, a frequent and troubleſome cough, without any great hemorrhage, or even without any hemorrhage at all, may damage the lungs to ſuch a degree, eſpecially if they be of a more tender ſtructure than uſual, as to lay the foundation of a phthiſis almoſt always incurable.

Again, by a long-continued and violent cough, the paſſage of the blood through the lungs being impeded, it muſt neceſſarily flow through the veins towards the head: hence redneſs and lividneſs in the countenance, hemorrhages, palſies, apoplexies, and ſometimes mortal convulſions. Laſtly, by a violent cough the abdominal viſcera are perpetually compreſſed with remarkable violence; and if any part happens to be weaker than uſual, a hernia, prolapſus uteri, abortion, or ſimilar accidents, may happen.

Even when the cough is more gentle, if it happens to be importunate and frequent, although we have nothing of this kind to fear, yet the patient is by no means free from danger; as he is thereby agitated, fatigued, has his conſtitution broken, is deprived of reſt, has a fever brought upon him, his lungs are ſhaken and irritated, digeſtion and all the other functions are impeded, till at laſt he ſinks under a complication of maladies.

106 Sneezing. Sneezing is ſomewhat akin to cough, as conſiſting of a very full inſpiration, to which ſucceeds a moſt violent exſpiration, by which the air is driven out through the noſtrils with immenſe violence, and ſweeps the paſſage through them as it goes out. It is a convulſion much more violent than a cough, and is beſides very difficult to be ſtopped when once a propenſity to it has taken place. As a cough proceeds from an irritation of the glottis, trachea, bronchia, and lungs, ſo ſneezing ariſes from an irritation of the membrane of the noſtrils, but rarely from ſympathy with any diſtant part. It is ſometimes of ſervice, as well as a cough; though it is alſo ſometimes prejudicial, for the reaſons which have been already aſſigned.

107 Digeſtion. The laſt part of Dr Gregory's treatiſe neceſſary to be taken notice of here, is that which conſiders diſeaſes ariſing from a bad digeſtion, diſordered motion of the inteſtines, and ſome of the principal ſecretions. The firſt of theſe, he ſays, are ſometimes very troubleſome, though ſeldom dangerous. The principal ſymptoms are oppreſſion, anxiety, pain at the ſtomach; eructation, by reaſon of air extricated from the fermenting aliments, and irritating the ſtomach; nauſea and vomiting, from the irritation and diſtenſion of the ſame organ; the belly ſometimes too coſtive, and ſometimes too looſe; a defect of nouriſhment; a general debility; relaxation of the ſolid parts; too great thinneſs of the fluids; all the functions impeded; pain of the head; vertigo, ſyncope, aſthma, palpitation; great ſinking of the ſpirits, eſpecially if the patient has been of a peculiar conſtitution; ſometimes the gout, ſometimes a dropſy, or a ſlow fever which may prove mortal.

Diſorders of Digeſtion.

108 Coſtiveneſs. The motion of the inteſtines may be either too great or too little; and hence proceeds either coſtiveneſs or looſeneſs. The former is frequently not to be accounted morbid; but, when it is, it may ariſe from the ſtructure of the inteſtines being injured, or from their being ſhut up or obſtructed by ſpaſm or otherwiſe, or from a deficiency of thoſe humours which moiſten the inteſtines; or it may ariſe from mere debility, from a palſy of the fibres perhaps, or from a deficiency of the uſual ſtimulus, of the bile, for inſtance, or from too dry or ſlender a diet.

The conſequences of long-continued coſtiveneſs, are firſt an affection of the alimentary canal, and, then of the whole body. The ſtomach is diſeaſed, and does not digeſt the aliments properly; the whole body is left deſtitute of its uſual ſtimulus; the blood is corrupted, perhaps from the reſorption of the putrid matter into it. The circulation through the abdominal viſcera is impeded; hence frequent and irregular congeſtions, varices of the veins, hemorrhoids, &c. Nay the inteſtines themſelves being overloaded, diſtended and irritated by an heavy, acrid, and putrid load of aliment or other matters, are excited to new and unuſual contractions, which, if they do not get the better of the obſtruction, bring on tormina, colic, or an iliac paſſion, inflammation and gangrene, fatal in a very ſhort time.

109 Looſeneſs. Looſeneſs, or diarrhœa, is a malady extremely common; being ſometimes a primary diſeaſe, and ſometimes only a ſymptom or an effect of others. Sometimes it is a ſalutary effort of nature, ſuch as the phyſician ought to imitate and bring on by art. It is alſo familiar to infants, and to people of a certain conſtitution; and to them coſtiveneſs is very prejudicial. It may ariſe, in the firſt place, from ſomething taken into the body, or generated in the inteſtines; from a fermentation and corruption of the maſs of aliments; from the bile being too abundant and acrid, or from blood or pus poured into the inteſtines; from the inteſtines themſelves being eroded, or deprived of their natural mucus; from the humours being driven from the ſurface of the body towards the inward parts, as by cold, eſpecially when applied to the feet; or from a general corruption of the whole body, as in the phthiſis, hectic, or putrid fever, eſpecially towards the end of theſe diſorders. In fevers it is ſometimes ſalutary, or even puts an end to the diſeaſe altogether, or at leaſt renders it milder: more frequently, however, deriving its origin from putreſcency, it is of no ſervice, but rather exhauſts the ſtrength of the patient. A diarrhœa likewiſe, almoſt incurable, and often mortal in a ſhort time, frequently ariſes after the operation for the fiſtula in ano. Some have their inteſtines ſo extremely weak and moveable, that from the ſlighteſt cauſe, ſuch as catching cold, any violent commotion of the mind, &c. they are ſubject to a violent diarrhœa. Laſtly, whatever be its origin, if it hath continued for a long time, the viſcera are rendered ſo weak and irritable,

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ritable, that the diſeaſe, though often removed, ſtill returns from the ſlighteſt cauſes, and even ſuch as are not eaſily diſcovered.

A diarrhœa proves very pernicious, by hindering digeſtion and the nouriſhment of the body; for the ſtomach is commonly affected, and the aliments paſs through the inteſtines ſo quickly, that they can neither be properly digeſted, nor are the lacteals able to abſorb the chyle from them as they go along. Such a violent evacuation is alſo hurtful by exhauſting the body, and carrying off a great quantity of the nutritious matter from the blood. Neither, indeed, is it only the alimentary maſs which is thrown out ſooner than it ought to be; but at the ſame time, a great quantity of the fluids ſecreted in the inteſtines, ſo that the whole body quickly partakes of the debility.

Sometimes a violent and long continued diarrhœa riſes to ſuch a height, that the aliment is diſcharged with little or no alteration. Sometimes alſo, though rarely, from a ſimilar cauſe, or from the obſtruction of the meſenteric glands, and its other paſſages into the blood, the chyle itſelf is thrown out like milk along with the excrements; and this diſeaſe is called the *fluxus cæliacus*.

110 Dyſentery

A dyſentery is attended with very ſevere gripes in the belly, a frequent deſire of going to ſtool, and vain efforts which excrete nothing beſides the mucus of the inteſtines mixed with a little blood; and is accompanied with exceſſive debility, and frequently with putreſcency and fever. It is thought to ariſe from the conſtriction of ſome part of the inteſtines, of the colon eſpecially: by which means the bowels, though ever ſo much irritated, can paſs nothing; neither can the diſeaſe be removed until the belly has been well purged by proper medicines.

111 Teneſmus.

A teneſmus is a frequent and inſatiable propenſity to ſtool, without being able to paſs any thing, notwithſtanding the moſt violent efforts. It may be occaſioned by any kind of irritation, either of the rectum itſelf or of the neighbouring parts, by acrid ſubſtances taken into the body; by ſome of the ſtronger purges, eſpecially aloes, which is very difficult of ſolution, and will paſs even to the rectum with very little alteration; by a violent and obſtinate diarrhœa, dyſentery, hæmorrhoids, worms, fiſtula, calculus, ulcer in the bladder, urethra, &c. It is often very pernicious, both from the exceſſive uneaſineſs it occaſions to the patient, and from its exhauſting his ſtrength, by the frequent and vain efforts bringing on a prolapſus ani, and communicating the violent irritation to the neighbouring parts, as the bladder, &c.

112 Nauſea and vomiting.

A nauſea and vomiting are diſorders very common, and owing to almoſt innumerable cauſes: not only to affections of the ſtomach itſelf, but alſo to affections and irritations of the remoteſt parts of the body which may act upon the ſtomach by ſympathy. Every irritation and diſtention of that viſcus therefore, a load of crude aliment, an obſtruction about the pylorus, all acrid ſubſtances taken into it, diſeaſes of the liver, inteſtines, kidneys, uterus, the head, the feet, the ſkin or indeed the whole body, inflammation, the ſtone, king's evil, ſcirrhus, apoplexy, compreſſion of the brain, fracture of the ſkull, vertigo, ſyncope, violent pain, the gout, eſpecially when repelled, fevers, paſſions of the mind, diſagreeable imaginations or diſcourſes, frequently induce nauſea and vomiting.

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Theſe affections are often ſerviceable by freeing the ſtomach from ſomething with which it was overloaded; promoting ſpitting in ſome caſes where the lungs are overcharged with mucus, blood, pus, or water; producing ſweat, and a free and proper diſtribution of blood to the ſurface of the body; partly, perhaps, by the great ſtraining which accompanies vomiting, but rather by that wonderful ſympathy which takes place between the ſtomach and ſkin: and hence, in many diſeaſes, vomiting is a moſt excellent remedy. It is however in ſome caſes hurtful, if too violent or too frequently repeated, partly by debilitating and making the ſtomach more eaſily moved; and partly by fatiguing the patient with violent ſtrainings, which occaſion hernias, abortions, &c.

113 Iliac paſſion.

Sometimes we find the motion of the inteſtines totally inverted, from the anus to the mouth; a moſt dangerous diſtemper, which hath obtained the name of the *iliac paſſion*. It moſt frequently ariſes from ſome obſtruction in the alimentary canal hindering the deſcent of the excrements, as ſcirrhus, ſpaſm, inflammation, &c.: though the moſt perfect iliac paſſion takes place without any obſtruction, ſo that clyſters will be vomited; and even after this has continued for ſeveral days, the patients have at length recovered.

A ſlighter degree of the iliac paſſion, namely the inverſion of the periſtaltic motion of the duodenum, always takes place in long continued and violent vomiting, as in ſea-ſickneſs, or when a perſon has taken too large a doſe of an emetic; by which means a vaſt quantity of bile frequently aſcends into the ſtomach, and is diſcharged by vomiting.

114 Cholera.

An exceſſive vomiting with looſeneſs is called a *cholera*, when the matter diſcharged has a bilious appearance. It ariſes from a very great irritation of the alimentary canal without any obſtruction; and is for the moſt part occaſioned by too great a quantity, or from an acrimony of the bile, from whence it takes its name. It may originate from ſeveral cauſes, as too ſtrong a doſe of an emetic and cathartic medicine, eating too great a quantity of ſummer-fruits, &c. and is a very violent malady, often killing the patient in a few hours, unleſs proper remedies be applied in time.

115 Obſtructed perſpiration.

From a ſuppreſſion of any of the ſecretions, or a diſorder of any of the ſecretory organs, many miſchiefs may ariſe. A diminution of perſpiration produces plethora, laſſitude, languor, depreſſion of mind, bad digeſtion, loſs of appetite, and even a general corruption of the humours from the retention of ſuch a quantity of putreſcent matter.—The more ſuddenly the diminution or ſuppreſſion of the perſpiration takes place, the ſooner the miſchief is produced, and the greater it is; not only by retaining the matter which ought to be thrown out, but by repelling the humours from the ſurface of the body, and directing them to other parts; whence fevers, inflammations, congeſtions of the blood, &c. frequently take place.

Thus ſuppreſſion of perſpiration may ariſe from many different cauſes; as from cold ſuddenly applied to the body when very hot; ſometimes from very violent paſſions of the mind; or from ſpaſmodic diſeaſes, as the hyſterics, &c. It may be ſuppreſſed alſo by that kind of contriction of the veſſels of the ſkin which is produced by various kinds of fevers, the nature of which has hitherto been but little known.

116
Exceſſive perſpiration.

Exceſſive perſpiration or ſweating is injurious by debilitating the body, relaxing the ſkin, and expoſing the patient to all the evils which ariſe from catching cold. It may even be carried to ſuch a height as to produce fainting and death; though it muſt be owned that we cannot eaſily bring examples of people having from this cauſe their blood inſpiſſated, corrupted, or being thence made liable to inflammations and fevers.

117
Suppreſſion of urine.

A ſuppreſſion of urine is ſtill more dangerous than that of perſpiration, and unleſs relieved in a ſhort time will certainly prove fatal. This diſorder, which is called *iſchuria*, may ariſe from various diſeaſes of the kidneys, ureters, bladder, urethra, &c. Thus any obſtruction or irritation of one or other of the kidneys or ureters, by a ſtone, gravel, mucus, blood, inflammations, ſpaſm, ſuppuration, ſcirrhus, ſwellings of the neighbouring parts, &c. may either prevent the urine from being ſecreted, or may give riſe to a ſcanty or depraved ſecretion, or finally may obſtruct its paſſage into the bladder after it is ſecreted.

The urine alſo, after it has entered the bladder, is there frequently ſuppreſſed, by reaſon of various diſorders to which that organ is liable, as an irritation or inflammation, ſpaſm, acrid ſubſtances injected, or ſympathy with the neighbouring parts; or by reaſon of the texture of the bladder itſelf being deſtroyed, or from a palſy, ſcirrhus, ulcer, &c. in the bladder. Or, laſtly, the urine may be retained in the bladder from a general ſtupor, as from a diſeaſe of the brain, which happens in ſome fevers, when the patient is neither ſenſible of the uſual ſtimulus, nor even of one much greater, ſo that the fibres can ſcarcely be excited to contraction by any means whatever. This, in fevers, is always a bad ſign, and ſometimes even proves fatal.

A ſuppreſſion of urine for any length of time produces an immenſe diſtenſion of the bladder, oppreſſion, uneaſineſs, and pain, not only of the part itſelf, but of the ſurrounding ones, and even of the whole body; a ſpaſm, or inſuperable conſtriction of the ſphincter; an inflammation, gangrene, or laceration of the bladder itſelf: a violent irritation of the whole habit; then a nauſea, vomiting, vertigo, general ſtupor, and an impregnation of the whole maſs of blood with a humour of an urinous nature, which at laſt being poured out into various cavities of the body, eſpecially of the head, ſoon brings on a deep ſleep, convulſions, and death.

118
Dyſuria.

From the ſame cauſes, but acting with leſs force, proceeds that diſeaſe called a *dyſuria*, when the urine paſſes with difficulty and pain, and is frequently red, black, bloody, purulent, mucous and ſandy; the reaſon of which appearances is very much unknown.

119
Strangury.

—The moſt frequent complaint, however, in making water, is where the patient has a continual and violent deſire of paſſing his urine, while at the ſame time only two or three drops can be paſſed at once, and that not without ſome pain. This is occaſioned even in healthy people, by ſome acrid ſubſtance taken into the ſtomach; and is very common to old people, who are generally ſubject to diſorders of the kidneys and bladder. It ariſes alſo frequently from a ſtone irritating the bladder, or from an inflammation of it, or its being deprived of its mucus, or this laſt being ſomehow or other corrupted; or laſtly, from certain diſeaſes or ſome particular ſtate of the neighbouring parts, as of the uterus, vagina, urethra, proſtrate gland, &c.

120
Incontinence of urine.

Akin to the ſtrangury is an incontinence of urine, when the patient's water either comes away againſt his will, or altogether without his knowledge. This diſorder may ariſe from debility, palſy, an ulcer or wound, or any long-continued and violent irritation of the bladder, eſpecially of its ſphincter, as from a ſtone, a general palſy, or in females, difficult labour injuring the neighbouring parts.—This ſymptom occurs in a great number of diſeaſes, eſpecially in the hydrocephalus.—Sometimes the urine is expelled with violence, either by reaſon of univerſal ſpaſms, or by violent contractions of the muſcles of reſpiration, as in ſneezing, laughter, &c.

121
Urinary calculi.

Among the diſorders incident to the urine we may reckon the production of calculi, which frequently bring on the moſt excruciating and dangerous diſeaſes. —The urine, beſides the water and ſalts, contains no ſmall ſhare of the glutinous part of the blood already ſomewhat corrupted, and ſtill inclined to farther corruption. Hence the urine even of the moſt healthy people depoſits a ſediment after it has ſtood for ſome time; and though none of this ſediment be formed in an healthy body, yet if the ſmalleſt particle of foreign matter be introduced into the bladder, a cruſt ſoon gathers round it, and it is ſure to become the baſis of a ſtone, which by degrees grows to a very great ſize. It is not unlikely, alſo, that ſome unknown fault of the fluids may contribute to the production of thoſe calculi, as the ſtone is well known to be an hereditary diſeaſe, and to be born with the patient. Calculous perſons alſo are commonly ſubject to complaints of the ſtomach, eſpecially to an acidity of it; and many have received no little relief from alkaleſcent or alkaline medicines.—From the ſame cauſes may calculi be formed in the kidneys; from which proceed a horrid train of ſymptoms deſcribed in the ſubſequent part of this treatiſe.

It is now found by accurate experiments of the moſt able chemiſts, that urinary calculi do not, as was once ſuppoſed, conſiſt almoſt entirely of an earthy matter. Their principal conſtituent is a peculiar acid approaching more nearly to the phoſphoric found in the bones than to any other. But the acid of calculus being in ſome reſpects peculiar in its nature, has among modern chemiſts obtained a peculiar name, and been diſtinguiſhed by the appellation of the *lithic acid*. It is highly probable that this acid preſent in the circulating maſs, is precipitated and diſengaged by the introduction of other acids, and thus thrown off in greater quantities by the kidneys. Thus then we can underſtand the influence of acids as tending to the generation of calculus, and of alkalies as tending to prevent it.

122
Schirrhus.

The laſt diſorder here to be taken notice of is a diſorder of the glands themſelves, owing to ſome kind of obſtruction, and is one of the moſt dreadful diſeaſes incident to human nature. Hence happens a

great

Scirrhus. great ſwelling and ſurpriſing hardneſs, not only without pain, but ſometimes even with a diminution of ſenſation in the part affected; and when the gland is thus affected, it is called a *ſcirrhus*. Sometimes it remains in this ſtate for a long time; but ſooner or later produces the moſt excruciating torment. By degrees it is affected with a ſlow and malignant ſuppuration, degenerating into an horrid ulcer, conſuming not only the part itſelf, but eating away the neighbouring ones, and corrupting the whole body with the moſt acrid and incurable poiſon. This diſeaſe is called a *cancer*, of which the cauſes are very little known.

Verſatility of the Human Conſtitution. Of the organs in both ſexes concerned in the function of generation, and of that function as far as we yet know any thing reſpecting it, an account has already been given in ANATOMY; and after what has already been ſaid of the different functions, and of the morbid affections, to which theſe are ſubjected, we may conclude our remarks on the theory of medicine, with mentioning the remarkable verſatility of the human conſtitution; which, more than that of any other animal, is capable of accommodating itſelf to every climate, and to all kind of diet. Hence we may conclude, that a large proportion of the diſeaſes to which we are ſubjected are produced by ourſelves.

PRACTICE of MEDICINE, or an Account of the principal Diſeaſes to which the Human Body is ſubjected.

123 General Arrangement of Diſeaſes.

WE have already defined medicine to be the art of preventing, curing, and alleviating, theſe diſeaſes to which mankind are ſubjected. While theſe affections, however, are in number almoſt infinite, each in its progreſs is ſubjected to almoſt endleſs varieties from differences in climate, conſtitution, treatment, and a variety of other particulars. Hence we may readily explain both the difficulty of diſtinguiſhing morbid affections from each other in actual practice, and the diverſity of names which have been affixed to them in the writings of ancient phyſicians. It may readily be ſuppoſed, that in this as well as other ſubjects, there has been a gradual improvement from the progreſſive labours of induſtrious and ingenious men. And although much yet remains to be done in the proper arrangement and diſtinction of diſeaſes, or what has been called *methodical noſology*, yet there cannot be a doubt, that during the courſe of the preſent century, this ſubject has received very great improvements. For theſe, we are in the firſt place highly indebted to the labours of Franciſcus Boiſſier de Sauvages, an eminent profeſſor of medicine at Montpelier, who, following out an idea ſuggeſted by the ſagacious Dr Sydenham of England, firſt ſucceſsfully attempted to arrange diſeaſes as botaniſts had done plants, into claſſes, orders, genera, and ſpecies. Since the publication of the *Noſologia Methodica* of Sauvages, this ſubject has been ſucceſsfully cultivated by ſeveral ingenious men, particularly by Sir Charles Linnæus of Upſal, to whoſe genius for arrangement every branch of natural hiſtory, but botany in particular, has been ſo highly indebted; by Rodolphus Auguſtus Vogel, an eminent profeſſor at Gottengen: and by John Baptiſt Sagar, a diſtinguiſhed phyſician at Iglaw in Moravia: but of all the ſyſtems of arrangement yet preſented to the medical world, that publiſhed by the late illuſtrous Dr William Cullen of Edinburgh, may juſtly be conſidered as the beſt. In treating, therefore, of the principal diſeaſes to which the human body is ſubjected, we ſhall follow his plan, endeavouring to deliver the beſt eſtabliſhed obſervations reſpecting the hiſtory, theory, and practice of each. And in treating of particular genera of diſeaſes, although we follow the arrangement of Dr Cullen, yet for the ſatisfaction of the reader, we ſhall point out the claſſes to which the ſame affection is referred by the other eminent writers whom we have mentioned. And on this account, it may not be improper briefly to enumerate the general claſſes to which each of them have referred the affections of the human body.

The claſſes of Sauvages are,

1. Vitia.
2. Febres.
3. Phlegmaſiæ.
4. Spaſmi.
5. Anhelationes.
6. Debilitates.
7. Dolores.
8. Veſaniæ.
9. Fluxus.
10. Cachexiæ.

The claſſes of Linnæus are,

1. Exanthematici.
2. Critici.
3. Phlogiſtici.
4. Doloroſi.
5. Mentales.
6. Quietales.
7. Motorii.
8. Suppreſſorii.
9. Evacuatorii.
10. Deformes.
11. Vitia.

The claſſes of Vogel are,

1. Febres.
2. Profluvia.
3. Epiſcheſes.
4. Dolores.
5. Spaſmi.
6. Hyperæſtheſes.
7. Cachexiæ.
8. Paranoiæ.
9. Vitia.
10. Deformitates.

The claſſes of Sagar are,

1. Vitia.
2. Palgæ.
3. Cachexiæ.
4. Dolores.
5. Fluxus.
6. Suppreſſiones.
7. Spaſmi.
8. Anhelationes.
9. Debilitates.
10. Exanthemata.
11. Phlegmaſiæ.
12. Febres.
13. Veſaniæ.

After this ſhort view of different claſſifications, we ſhall next preſent to our readers a more particular account of the arrangement of Dr Cullen; which, although it can by no means be repreſented as free from errors or imperfections, is yet in many reſpects the beſt that has hitherto been publiſhed.

CULLEN'S *Arrangement.*

CLASS I. PYREXIÆ. A frequent pulſe coming on after an horror; conſiderable heat; many of the functions

tions injured; the ſtrength of the limbs eſpecially diminiſhed.

ORDER I. Febres. Pyrexia without any primary local affection, following langour, laſſitude, and other ſymptoms of debility.

Sect. I. *Intermittentes.* Fevers ariſing from the miaſma of marſhes; with an apyrexia, or at leaſt a very evident remiſſion; but the diſeaſe returns conſtantly, and for the moſt part with a horror or trembling. There is only one paroxyſm in a day.

Genus I. Tertiana. Similar paroxyſms at an interval of about 48 hours, coming on moſt commonly at mid-day. A tertian heat either;

I. An apyrexia interpoſed;

1. Varying the duration of the paroxyſms.

A. The tertian whoſe paroxyſms are not extended beyond 12 hours,

B. The tertian with paroxyſms extended beyond 12 hours

2. Varying in the return of the paroxyſms.

C. The tertian returning every day with unequal paroxyſms alternately ſimilar to one another.

D. The tertian returning every third day with two paroxyſms on the ſame day.

E. The tertian returning every day, with two paroxyſms on every third day, and only one on the intermediate ones.

F. The tertian returning every day, with a notable remiſſion interpoſed between the odd and the even days, but a leſs remarkable one between the even and the odd one.

3. Varying in its ſymptoms.

G. The tertian accompanied with a diſpoſition to ſleep.

H. Accompanied with ſpaſm and convulſive motions.

I. Accompanied with an effloreſcence on the ſkin.

K. With phlegmaſia.

4. Varying in being complicated with other diſeaſes.

5. Varying as to its origin.

II. With the interpoſition only of a remiſſion between the paroxyſms.

Genus II. Quartana. Similar paroxyſms, with an interval of about 72 hours, coming on in the afternoon.

I. With the interpoſition of an apyrexia.

1. Varying in the type.

A. The quartan with ſingle paroxyſms, returning every fourth day, none on the other days.

B. With two paroxyſms every fourth day, and none on the other days.

C. With three paroxyſms every fourth day, and none on the intermediate days.

D. Of the four days having only the third free from fever, with ſimilar paroxyſms every fourth day.

E. The quartan coming on every day, with ſimilar paroxyſms every fourth day.

2. Varying in its ſymptoms.

3. Varying in being complicated with other diſeaſes.

II. With a remiſſion only between the paroxyſms.

Genus III. Quotidiana. Similar paroxyſms with an inverval of about 24 hours, coming on in the morning.

I. With the interpoſition of apyrexia.

1. Varies in being ſolitary.

A. Univerſal.

B. Partial.

2. Complicated with other diſeaſes.

II. With a remiſſion only between the paroxyſms.

Sect. II. *Continuæ.* Fevers without any intermiſſion, and not occaſioned by marſh miaſmata; attended with exacerbations and remiſſions, though not very remarkable.

Genus IV. Synocha. Great heat; a frequent, ſtrong, and hard pulſe; high-coloured urine; the functions of the ſenſorium a little diſturbed.

Genus V. Typhus. A contagious diſeaſe; the heat not greatly above the natural; the pulſe ſmall, weak, and for the moſt part frequent; the urine little changed; the functions of the ſenſorium very much diſturbed, and the ſtrength greatly diminiſhed.

The ſpecies are,

I. Typhus *petechialis.* Typhus for the moſt part with petechiæ.

Varying in degree. 1. Mild typhus. 2. Malignant typhus.

II. Typhus *icterodes.* Typhus with a yellowneſs of the ſkin.

Genus VI. Synochus. A contagious diſeaſe. A fever compoſed of a ſynocha and typhus; in the beginning a ſynocha, but towards the end a typhus.

ORDER II. Phlegmaſiæ. A ſynocha fever, with inflammation or topical pain, the internal function of the part being at the ſame time injured; the blood covered with ſize.

Genus VII. Phlogoſis. Pyrexia; redneſs, heat, and painful tenſion, of ſome external part.

The ſpecies are,

I. Phlogoſis (*phlegmone*) of a vivid red colour; a ſwelling well defined, for the moſt part elevated to a point, and frequently degenerating into an abſceſs, with a beating or throbbing pain.

The variations are, 1. In the form. 2. In the ſituation.

II. Phlogoſis (*erythema*) of a reddiſh colour, vaniſhing by preſſure; of an unequal and creeping circumference, with ſcarce any ſwelling; ending in the ſcaling off the cuticle, in phlyctenæ, or bliſters.

The variations are, 1. In the degree of violence. 2. In the remote cauſe. 3. In being complicated with other diſeaſes.

The conſequences of a phlogoſis are, an impoſthume, gangrene, ſphacelus.

Genus VIII. Ophthalmia. A redneſs and pain of the eye, with an inability to bear the light; for the moſt part with an effuſion of tears.

The ſpecies and varieties of the ophthalmia are,

I. Idiopatic.

1 Ophthalmia (*membranarum*), in the tunica adnata, and the membranes lying under it, or the coats of the eye.

A. Varying in the degree of the external inflammation.

B. In the internal coats affected.

2. Ophthalmia (*tarſi*) of the eye-lids, with ſwelling, eroſion, and glutinous exſudation.

II. Symptomatic.

1. From a diſeaſe of the eye itſelf.

2. From diſeaſes of other parts, or of the whole body.

Genus IX. Phrenitis. Violent pyrexia; pain of the head; redneſs of the face and eyes; inability to endure the light or any noiſe; watchfulneſs: a fierce delirium, or typhomania.

I. Idiopathic.

II. Symptomatic.

Genus X. Cynanche. Pyrexia ſometimes inclining to a typhus; difficulty of ſwallowing and breathing; with a ſenſation of narrowneſs in the fauces.

The ſpecies are,

I. Cynanche (*tonſillaris*) affecting the mucous membrane of the fauces, but eſpecially the tonſils, with redneſs and ſwelling, accompanied with a ſynocha.

II. Cynanche (*maligna*) affecting the tonſils and mucous membrane of the fauces with ſwelling, redneſs, and mucous cruſts of a whitiſh or aſh colour, creeping, and covering ulcers; with a typhus fever and exanthemata.

III. Cynanche (*trachealis*) attended with difficult reſpiration, noiſy and hoarſe inſpiration, loud cough, without any apparent tumor in the fauces, ſomewhat difficult deglutition, and a ſynocha.

IV. Cynanche (*pharingæa*) attended with redneſs in the bottom of the fauces, very difficult and painful deglutition, reſpiration ſufficiently free, and a ſynocha.

V. Cynanche (*parotidæa*) with great ſwelling of the parotids and maxillary glands appearing on the outſide; the reſpiration and deglutition but little injured; a ſynocha, for the moſt part mild.

Diſeaſes of this genus are ſymptomatic, either from external or internal cauſes.

Genus XI. Pneumonia. Pyrexia, with a pain in ſome part of the thorax, difficult reſpiration, and cough. The ſpecies are.

I. Peripneumony, with a pulſe not always hard, but ſometimes ſoft; an obtuſe pain of the breaſt; the reſpiration always difficult; ſometimes the patient cannot breathe unleſs in an upright poſture; the face ſwelled, and of a livid colour; the cough for the moſt part moiſt, frequently bloody.

1. Simple idiopathic peripneumonies.

Varying in degree.

2. Idiopathic peripneumonies complicated with fever.

3. Symptomatic peripneumonies.

II. Pleuriſy, with a hard pulſe; for the moſt part attended with a pungent pain of one ſide, augmented chiefly during the time of inſpiration; an uneaſineſs when lying on the ſide; a moſt painful cough, dry in the beginning of the diſeaſe, afterwards moiſt, and frequently bloody.

1. Simple idiopathic pleuriſies.

2. Pleuriſies, complicated (1.) With fever. (2.) With catarrh.

3. Symptomatic pleuriſies.

4. Falſe pleuriſies.

The conſequences of pleuriſy are a vomica or empyema.

Genus XIII. Carditis. Pyrexia; pain about the heart; anxiety; difficulty of breathing; cough; unequal pulſe; palpitation of the heart, and fainting.

I. Idiopathic.

II. Symptomatic.

Genus XIV. Peritonitis. Pyrexia; pain of the belly, exaſperated by an upright poſture, without the proper ſigns of other abdominal phlegmaſiæ. If the diagnoſtics of the following diſeaſe are given, they may be reckoned as ſo many ſpecies of this genus.

I. Peritonitis (*propria*) ſituated in the peritonæum, properly ſo called, ſurrounding the inſide of the abdomen.

II. Peritonitis (*omentalis*) in the peritonæum extended through the omentum.

III. Peritonitis (*meſenterica*) in the peritonæum ſpread through the meſetery.

Genus XV. Gaſtritis. Pyrexia inclining to a typhus; anxiety; pain and heat of the epigaſtrium, augmented when any thing is taken into the ſtomach; an inclination to vomit, and an immediate rejection of every thing ſwallowed; an hickup.

I. Idiopathic.

1. From internal cauſes.

A. Gaſtritis (*phlegmonodea*) attended with acute pain and violent pyrexia.

2. From external cauſes.

B. Gaſtritis (*eryſipelatoſa*), with a leſs violent fever and pain; an eryſipelatous redneſs appearing on the fauces.

II. Symptomatic.

Genus XVI. Enteritis. Pyrexia of a typhous nature; pungent pain of the belly, ſtretching and twiſting round the navel; vomiting; the belly obſtinately bound.

I. Idiopathic.

1. Enteritis (*phlegmonodæa*), with acute pain, violent fever, vomiting, and conſtipation of the belly.

2. Enteritis (*eryſipelatoſa*) with leſs acute fever and pain, without vomiting; but accompanied with a diarrhœa.

II. Symptomatic.

Genus XVII. Hepatitis. Pyrexia; tenſion and pain of the right hypochondrium; ſometimes pungent like that of a pleuriſy, but more frequently obtuſe; a pain reaching to the clavicle and top of the right ſhoulder; a difficulty of lying on the left ſide; dyſpnœa; dry cough, vomiting, and hickup.

Genus XVIII. Splenitis. Pyrexia; tenſion, heat, and ſwelling of the left hypochondrium, the pain increaſing by preſſure; without the ſigns of nephritis.

Genus XIX. Nephritis. Pyrexia; pain in the region of the kidney, often following the courſe of the ureter; frequent making of water, either thin and colourleſs, or very red; vomiting; ſtupor of the thigh; with a retraction or pain of the teſticle of the ſame ſide. The ſpecies are,

I. Idiopathic. Spontaneous.

II. Symptomatic.

Genus XX. Cyſtitis. Pyrexia; pain and ſwelling of the hypogaſtrium, frequent and painful making of water, or iſchuria; and teneſmus. The ſpecies are,

I. Theſe ariſing from internal cauſes.

II. Thoſe from external cauſes.

Genus XXI. Hyſteritis. Pyrexia; heat, tenſion, ſwelling,

General Arrangement of Diſeaſes.

ſwelling, and pain of the hypogaſtrium; the os uteri painful when touched; vomiting.

Genus XXII. Rheumatiſmus. A diſeaſe ariſing from an external and frequently very evident cauſe; pyrexia; pain about the joints, frequently purſuing the courſe of the muſcles; infeſting the knees and other large joints rather than thoſe of the feet or hands; increaſed by external heat.

The ſpecies are either idiopathic or ſymptomatic. The former varies in ſituation.

A. In the muſcles of the loins.

B. In the muſcles of the coxendix.

C. In the muſcles of the breaſt.

Genus XXIII. Odontalgia; a rheumatiſm of the jaws from a caries of the teeth.

Genus XXIV. Podagra. An hereditary diſeaſe, ariſing without any evident external cauſe, but for the moſt part preceeded by an unuſual affection of the ſtomach; pyrexia; pain of a joint for the moſt part of the great toe of the foot, at leaſt infeſting chiefly the wriſts and ankles; returning by intervals; and often alternated with the affections of the breath and other internal parts.

I. Podagra (*regularis*) with a pretty violent inflammation of the joints remaining for ſome days, and by degrees going off with ſwelling, itching, and deſquamation of the affected part.

II. Podagra (*atonica*) with an atony of the ſtomach, or ſome other internal part; and either without the uſual inflammation of the joints, or only with ſlight and wandering pains; and frequently alternated with dyſpepſia, or other ſymptoms of atony.

III. Podagra (*retrograda*) with the inflammation of the joints ſuddenly receding, and an atony of the ſtomach and other parts immediately following.

IV. Podagra (*aberrans*) with the inflammation of an internal part either preceding or not, and ſuddenly receding; with an inflammation of the joints.

Genus XXV. Arthropuoſis. Deep, obtuſe, and long-continued pains of the joints or muſcular parts, frequently following contuſions; with either no ſwelling, or a moderate and diffuſed one; no phlogoſis; pyrexia, at firſt gentle, afterwards hectic, and at length an impoſthume.

Order III. Exanthemata. Contagious diſeaſes; affecting a perſon only once in their life; beginning with fever; after a certain time appear phlogoſes, for the moſt part ſmall and in conſiderable number, and diſperſed over the ſkin.

Genus XXVI. Eryſipelas. A ſynocha of two or three days, for the moſt part attended with drowſineſs, often with a delirium. In ſome part of the ſkin, moſt frequently the face, appears a phlogoſis *erithema*. (G. VII. Sp. 2.) The ſpecies are,

I. Eryſipelas (*veſiculoſum*) with erythema, redneſs creeping, occupying a large ſpace, and in ſome parts ending in large bliſters.

II. Eryſipelas (*phlyctænodes*), with an erythema formed of a number of papulæ, chiefly occupying the trunk of the body, ending in phlyctenæ or ſmall bliſters.

The diſeaſe is alſo ſymptomatic.

Genus XXVII. Peſtis. An exceedingly contagious typhus, with the higheſt debility. On an uncertain day of the diſeaſe buboes and carbuncles break forth. It is various in degree, but the ſpecies are uncertain.

Genus XXVIII. Variola; a contagious ſynocha, with vomiting, and pain on preſſing the epigaſtrium. On the third day begins, and on the fifth is finiſhed, the eruption of inflammatory puſtules, which ſuppurate in the ſpace of eight days, and at laſt go off in cruſts, frequently leaving depreſſed cicatrices or pock-pits in the ſkin. The ſpecies are,

I. Variola (*diſcreta*) with few, diſtinct, turgid puſtules, having circular baſes; the fever ceaſing immediately after the eruption.

II. Variola (*confluens*) with numerous, confluent, irregularly ſhaped puſtules, flaccid, and little elevated; the fever remaining after the eruption.

Genus XXIX. Varicella. Synocha; papulæ breaking out after a ſhort fever, ſimilar to thoſe of the ſmall pox, but hardly ever coming to ſuppuration; after a few days going off in ſmall ſcales, but never leaving any mark.

Genus XXX. Rubeola. A contagious Synocha, with ſneezing, epiphora, and dry hoarſe cough. On the fourth day, or a little later, break forth ſmall, cluſtered, and ſcarce elevated papulæ: after three days going off in very ſmall branny ſcales.

I. Rubeola (*vulgaris*) with very ſmall confluent, corymboſe papulæ, ſcarce riſing above the ſkin.

Varying,

1. In the ſymptoms being more ſevere, and the courſe of the diſeaſe leſs regular.

2. In being accompanied with a quinſey.

3. With a putrid diatheſis.

II. Rubeola (*varioloides*) with diſtinct papulæ, raiſed above the ſkin.

Genus XXXI. Miliaria. Synochus with anxiety, frequent ſighing, fœtid ſweat, and points on the ſkin. On an uncertain day of the diſeaſe, break out red, ſmall, diſtinct papulæ, ſpread over the whole body as well as the face; the apices of which, after one or two days, become very ſmall white puſtules, remaining for a ſhort time.

Genus XXXII. Scarlatina. A contagious Synocha. On the fourth day of the diſeaſe the face ſwells a little; at the ſame time an univerſal redneſs occupies the ſkin in large ſpots, at length running together; after three days going off in branny ſcales; frequently ſucceeded by anaſarca. The ſpecies are,

I. Scarlatina (*ſimplex*), not accompanied with cynanche.

II. Scarlatina (*cynanchica*), with an ulcerous cynanche.

Genus XXXIII. Urticaria. An amphemerina fever. On the ſecond day of the diſeaſe, red ſpots reſembling the ſtinging of nettles, almoſt vaniſhing during the day, but returning in the evening with the fever, and after a few days going off altogether in very ſmall ſcales.

Genus XXXIV. Pemphigus. A contagious typhus. On the firſt, ſecond, or third day of the diſeaſe, bliſters break out in ſeveral parts of the body, of the bigneſs of a bean, remaining for many days, and at laſt pouring out a thin ichor.

Genus XXXV. Aphtha. Synochus; the tongue ſomewhat ſwelled and of a livid colour, as well as the fauces; eſchars firſt appearing in the fauces, but at length

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length occupying the whole internal part of the mouth, of a white colour, ſometimes diſtinct, often running together; quickly growing again when taken off; and remaining for an uncertain time.

The ſpecies are, 1. Idiophatic. 2 Symptomatic.

Order IV. Hæmorrhagiæ. Pyrexia, with a profuſion of blood, without any external violence: the blood drawn from a vein hath the ſame appearance as in phlegmaſiæ.

Genus XXXVI. Epiſtaxis. Pain or weight of the head, redneſs of the face: a profuſion of blood from the noſe.

I. Idiopathic.

Varying according to the time of life.

1. Epiſtaxis of young people, with ſymptoms of an arterious plethora.

2. Epiſtaxis of old people, with ſymptoms of a venous plethora.

II. Symptomatic.

1. From internal cauſes.

2. From external cauſes.

Genus XXXVII. Hæmoptyſis. Redneſs of the cheeks; a ſenſation of uneaſineſs, or pain, and ſometimes of heat in the breaſt; difficulty of breathing; tickling of the fauces, either a ſevere or leſs violent cough, bringing up florid and frequently frothy blood.

The Idiopathic ſpecies are,

1. Hæmoptyſis (*plethorica*), without any external violence, and without being preceded by any cough or ſuppreſſion of any cuſtomary evacuation.

2. Hæmoptyſis (*violenta*), from external violence applied.

3. Hæmoptyſis (*phthiſica*), after a long continued cough, with a leanneſs and debility.

4. Hæmoptyſis (*calculoſa*), in which ſome calculous molecules, for the moſt part of a calcareous nature, are thrown up.

5. Hæmoptyſis (*vicaria*), after the ſuppreſſion of a cuſtomary evacuation.

Beſides theſe, there are a number of ſymptomatic ſpecies mentioned by different authors. The conſequence of an hæmoptyſis is, a

Phthiſis. A waſting and debility of the body, with a cough, hectic fever, and for the moſt part a purulent expectoration. The ſpecies are,

I. An incipient phthiſis, without any expectoration of pus.

II. A confirmed phthiſis, with an expectoration of pus.

Both ſpecies vary, 1. As to their remote cauſe. 2. As to the origin of the purulent matter.

Genus XXXVIII. Hæmorrhois. Weight and pain of the head; vertigo; pain of the loins; pain of the anus; livid painful tubercles, from which for the moſt part blood flows out; which ſometimes alſo drops out of the anus, without any apparent tumor. The ſpecies are,

1. Hæmorrhois (*tumens*), external from mariſcæ.

Varying.

A. Bloody.

B. Mucous.

2. Hæmorrhois (*procidens*), external from a *procidentia ani*.

3. Hæmorrhois (*fluens*), internal, without any ſwelling, or *procidentia ani*.

4. Hæmorrhois (*cæca*), with pain and ſwelling of the anus, without any profuſion of blood.

Genus XXXIX. Menorrhagia. Pains of the back, belly, and loins, like thoſe of child-birth; an unuſually copious flux of the menſes or blood from the vagina. The ſpecies are,

1. Menorrhagia (*rubra*), bloody in women neither with child nor in child-birth.

2. Menorrhagia (*abortus*), bloody in women with child.

3. Menorrhagia (*lochiales*), bloody in women after delivery.

4. Menorrhagia (*vitiorum*) bloody from ſome local diſeaſe.

5. Menorrhagia (*alba*), ſerous, without any local diſeaſe, in women not with child.

6. Menorrhagia (*Nabothi*), ſerous in women with child.

Order V. Profluvia. Pyrexia, with an increaſed ſecretion, naturally not bloody.

Genus XL. Catarrhus. Pyrexia frequently contagious; an increaſed excretion of mucus, at leaſt efforts to excrete it.

The ſpecies are for the moſt part ſymptomatic.

1. From cold.

2. From contagion.

Genus XLI. Dyſenteria. Contagious pyrexia; frequent mucus or bloody ſtools, while the alvine feces are for the moſt part retained; gripes; teneſmus.

Varying:

1. Accompanied with worms.

2. With the excretion of ſmall fleſhy or ſebaceous bodies.

3. With an intermittent fever.

4. Without blood.

5. With a miliary fever.

CLASS II. Neurosis. An injury of the ſenſe and motion, without an idiopathic pyrexia or any local affection.

Order. I. Comata. A diminution of voluntary motion, with ſleep, or a deprivation of the ſenſes.

Genus XLII. Apoplexia. Almoſt all voluntary motion diminiſhed, with ſleep more or leſs profound; the motion of the heart and arteries remaining.

The idiopathic ſpecies are,

1. Apoplexia (*ſanguinea*) with ſymptoms of univerſal plethora, eſpecially of the head.

2. Apoplexia (*ſeroſa*) with a leucophlegmatia over the whole body, eſpecially in old people.

3. Apoplexia (*hydrocephalica*) coming on by degrees; affecting infants, or thoſe below the age of puberty, firſt with laſſitude, a ſlight fever and pain of the head, then with ſlowneſs of the pulſe, dilatation of the pupil of the eye, and drowſineſs.

4. Apoplexia (*atrabiliaria*) taking place in thoſe of a melancholic conſtitution.

5. Apoplexia (*traumatica*) from ſome external injury mechanically applied to the head.

6. Apoplexia (*venenata*) from powerful ſedatives taken internally or applied externally.

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7. Apoplexia *(mentalis)* from a paſſion of the mind.

8. Apoplexia (*cataleptica*) the muſcles remaining contractile, by external motion of the limbs.

9. Apoplexia *(ſuffocata)* from ſome external ſuffocating power.

The apoplexia is frequently ſymptomatic.

1 Of an intermitting fever. 2 Continued fever. 3 Phlegmaſia. 4 Exanthema. 5 Hyſteria. 6 Epilepſy. 7 Podagra. 8 worms. 9 Iſchuria. 10 Scurvy.

Genus XLIII. Paralyſis. Only ſome of the voluntary motions diminiſhed, frequently with ſleep.

The idiopathic ſpecies are,

1 Paralyſis (*partialis)* of ſome particular muſcles only.

2. Paralyſis *(hemiplegica)* of one ſide of the body.

Varying according to the conſtitution of the body.

a. Hemiplegia in a plethoric habit.

b. In a leucophlegmatic habit.

3. Paralyſis *(paraplegica)* of one half of the body taken tranſverſely.

4. Paralyſis (*venenata)* from ſedative powers applied either internally or externally.

A ſymptom either of an Aſthenia or Palſy is,

Tremor; an alternate motion of a limb by frequent ſtrokes and intervals.

The ſpecies are, 1 Aſthenic. 2 Paralytic. 3 Convulſive.

ORDER II. Adynamiæ. A diminution of the involuntary motions whether vital or natural.

Genus XLIV. Syncope; a diminution, or even a total ſtoppage, of the motion of the heart for a little.

I. Idiopathic.

1. Syncope *(cardiaca)* returning frequently without any manifeſt cauſe, with violent palpitations of the heart during the intervals.—From a fault of the heart or neighbouring veſſels.

2. Syncope *(occaſionalis)* ariſing from ſome evident cauſe.—From an affection of the whole ſyſtem.

II. Symptomatic; or ſymptoms of diſeaſes either of the whole ſyſtem, or of other parts beſides the heart.

Genus XLV. Dyſpepſia. Anorexia, nauſea, vomiting, inflation, belching, rumination, cardialgia, gaſtrodynia, more or fewer of thoſe ſymptoms at leaſt concurring: from the moſt part with a conſtipation of the belly, and without any other diſeaſe either of the ſtomach itſelf or of other parts.

I. Idiopathic.

II. Symptomatic.

1. From a diſeaſe of the ſtomach itſelf.

2. From a diſeaſe of other parts, or of the whole body.

Genus XLVI. Hypochondriaſis. Dyſpepſia, with languor, ſadneſs and fear without any adequate cauſes, in a melancholy temperament.

Genus XLVII. Chloroſis. Dyſpepſia, or a deſire of ſomething not uſed as food; a pale or diſcoloured complexion; the veins not well filled; a ſoft tumor of the whole body; aſthenia; palpitation; ſuppreſſion of the menſes.

ORDER III. Spaſmi. Irregular motions of the muſcles or muſcular fibres.

Sect. I. *In the animal functions.*

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Genus XLVIII. Tetanus;—a ſpaſtic rigidity of almoſt the whole body.

Varying according to the remote cauſe, as it ariſes either from ſomething internal, from cold, or from a wound. It varies likewiſe from whatever cauſe it may ariſe, according to the part of the body affected.

Genus XLIX. Triſmus. A ſpaſtic rigidity of the lower jaw.—The ſpecies are,

1. Triſmus (*naſcentium)*, ſeizing infants under two months old.

2. Triſmus (*traumaticus)*, ſeizing people of all ages either from a wound or cold.

Genus L. Convulſio.—An irregular clonic contraction of the muſcles without ſleep.

I. Idiopathic.

II. Symptomatic.

Genus LI. Chorea, attacking thoſe who have not yet arrived at puberty, moſt commonly within the 10th or 14th year, with convulſive motions for the moſt part of one ſide in attempting the voluntary motion of the hands and arms, reſembling the geſticulations of mountebanks; in walking, rather dragging one of their feet after them than lifting it.

Genus LII. Raphania. A ſpaſtic contraction of the joints, with a convulſive agitation, and moſt violent periodical pain.

Genus LIII. Epilepſia A convulſion of the muſcles, with ſleep.

The idiopathic ſpecies are,

1. Epilepſia (*cerebralis)*, ſuddenly attacking without any manifeſt cauſe, without any ſenſe of uneaſineſs preceding, excepting perhaps a ſlight vertigo or ſcotomia.

2. Epilepſia (*ſympathetica)*, without any manifeſt cauſe, but preceded by the ſenſation of a kind of air riſing from a certain part of the body towards the head.

3. Epilepſia (*occaſionalis)*, ariſing from a manifeſt irritation, and ceaſing on the removal of that irritation.

Varying according to the difference of the irritating matter. And thus it may ariſe,

From injuries of the head; pain; worms; poiſon; from the repulſion of the itch, or an effuſion of any other acrid humour; from crudities in the ſtomach; from paſſions of the mind; from an immoderate hemorrhagy; or from debility,

Sect. II. *In the vital functions.*

In the action of the heart.

Genus LIV. Palpitatio. A violent and irregular motion of the heart.

In the action of the lungs.

Genus LV. Aſthma. A difficulty of breathing returning by intervals, with a ſenſe of ſtraitneſs in the breaſt, and a noiſy reſpiration with hiſſing. In the beginning of the paroxyſm there is either no cough at all, or coughing is difficult; but towards the end the cough becomes free, frequently with a copious ſpitting of mucus.—The idopathic ſpecies are,

1. Aſthma (*ſpontaneum)*, without any manifeſt cauſe or other concomitant diſeaſe.

2. Aſthma (*exanthematicum)*, from the repulſion of the itch or other acrid effuſion.

3. Aſthma (*plethoricum)*, from the ſuppreſſion of

ſome cuſtomary ſanguineous evacuation, or from a ſpontaneous plethora.

Genus LVI. Dyſpnœa. A continual difficulty of breathing, without any ſenſe of ſtraitneſs, but rather of fulneſs and infarction in the breaſt; a frequent cough throughout the whole courſe of the diſeaſe.

The idiopathic ſpecies are,

1. Dyſpnœa (*catarrhalis*), with a frequent cough, bringing up plenty of viſcid mucus.

2. Dyſpnœa (*ſicca*), with a cough for the moſt part dry.

3. Dyſpnœa (*aërea*), increaſed by the leaſt change of weather.

4. Dyſpnœa (*terrea*), bringing up with the cough an earthy or calculous matter.

5. Dyſpnœa (*aquoſa*), with ſcanty urine and œdematous feet; without any fluctuation in the breaſt, or other ſigns of an hydrothorax.

6. Dyſpnœa (*pinguedinoſa*), in very fat people.

7. Dyſpnœa (*thoracica*), from an injury done to the parts ſurrounding the thorax, or from ſome bad conformation of them.

8. Dyſpnœa (*extrinſeca*), from evident external cauſes.

The ſymptomatic ſpecies of dyſpnœa are ſymptoms,

1. Of diſeaſes of the heart or large veſſels.

2. Of a ſwelling in the abdomen.

3. Of various diſeaſes.

Genus LVII. Pertuſſis. A contagious diſeaſe; convulſive ſtrangulating cough reiterated with noiſy inſpiration; frequent vomiting.

Sect. III. *In the natural functions.*

Genus LVIII. Pyroſis. A burning pain in the epigaſtrium, with plenty of aqueous humour, for the moſt part inſipid, but ſometimes acrid, belched up.

Genus LIX. Colica. Pain of the belly, eſpecially twiſting round the navel; vomiting; a conſtipation.

The idiopathic ſpecies are,

1. Colica (*ſpaſmodica*), with retraction of the navel, and ſpaſms of the abdominal muſcles.

Varying, by reaſon of ſome ſymptoms ſupperadded. Hence,

a, Colica, with vomiting of excrements, or of matters injected by the anus.

b, Colica, with inflammation ſupervening.

2. Colica (*pictonum*), preceded by a ſenſe of weight or uneaſineſs in the belly, eſpecially about the navel; then comes on the colic pain, at firſt ſlight and interrupted, chiefly augmented after meals: at length more ſevere and almoſt continual, with pains of the arms and back, at laſt ending in a palſy.

Varying according to the nature of the remote cauſe; and hence,

a, From metallic poiſon.

b, From acids taken inwardly.

c, From cold.

d, From a contuſion of the back.

3. Colica (*ſtercorea*), in people ſubject to coſtiveneſs.

4. Colica (*accidentalis*), from acrid matter taken inwardly.

5. Colica (*meconialis*), in new-born children from a retention of the meconium.

6. Colic (*calloſa*), with a ſenſation of ſtricture in ſome part of the inteſtine, and frequently of a collection of flatus with ſome pain before the contricted part; which flatus alſo paſſing through the part where the ſtricture is felt, gradually vaniſhes: the belly ſlow, and at laſt paſſing only a few liquid fæces.

7. Colica (*calculoſa*), with a fixed hardneſs in ſome part of the abdomen, and calculi ſometimes paſſing by the anus.

Genus LX. Cholera. A vomiting of bilious matter, and likewiſe a frequent excretion of the ſame by ſtool; anxiety; gripes; ſpaſms in the calves of the legs.

I. Idiopathic.

1. Cholera (*ſpontanea*), ariſing in a warm ſeaſon, without any manifeſt cauſe.

2. Cholera (*accidentalis*), from acrid matters taken inwardly.

II. Symptomatic.

Genus LXI. Diarrhœa. Frequent ſtools; the diſeaſe not infectious; no primary pyrexia.

I. Idiopathic

1. Diarrhœa (*crapuloſa*), in which the excrements are voided in greater quantity than natural.

2. Diarrhœa (*biliosa*), in which yellow feces are voided in great quantity.

3. Diarrhœa (*mucoſa*), in which either from acrid ſubſtances taken inwardly, or from cold, eſpecially applied to the feet, a great quantity of mucus is voided.

4. Diarrhœa (*cœliaca*), in which a milky humour of the nature of chyle is paſſed.

5. Diarrhœa (*lienteria*), in which the aliments are diſcharged with little alteration ſoon after eating.

6. Diarrhœa (*hepatirrhœa*), in which a bloody ſerous matter is diſcharged without pain.

II. Symptomatic.

Genus LXII. Diabetes. A chronical profuſion of urine, for the moſt part preternatural, and in immoderate quantity.

I. Idiopathic.

1. Diabetes (*mellitus*), with urine of the ſmell, colour, and taſte of honey.

2. Diabetes (*inſipidus*), with limpid but not ſweet, urine.

II. Symptomatic.

Genus LXIII. Hyſteria. Rumbling of the bowels; a ſenſation as of a globe turning itſelf in the belly, aſcending to the ſtomach and fauces, and there threatening ſuffocation: ſleep; convulſions; a great quantity of limpid urine: the mind involuntarily fickle and mutable.

The following are by Sauvages reckoned diſtinct idiopathic ſpecies; but, by Dr Cullen, only varieties of the ſame ſpecies.

A, From a retention of the menſes.

B, From a menorrhagia cruenta.

C, From a menorrhagia ſeroſa, or fluor albus.

D, From an obſtruction of the viſcera.

E, From a fault of the ſtomach.

F, From too great ſalacity.

Genus LXIV. Hydrophobia. A diſlike and horror at any kind of drink, and occaſioning a convulſion of the pharynx; induced, for the moſt part, by the bite of a mad animal. The ſpecies are.

1. Hydro-

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I. Hydrophobia (*rabioſa*), with a deſire of biting the byſtanders; occaſioned by the bite of a mad animal.

II. Hydrophobia (*ſimplex*), without madneſs, or any deſire of biting.

Order IV. Veſaniæ. Diſorders of the judgment, without any pyrexia or coma.

Genus LXV. Amentia; an imbecility of judgment, by which people either do not perceive, or do not remember, the relations of things. The ſpecies are,

I. Amentia (*congenita*), continuing from a perſon's birth.

II. Amentia (*ſenilis*), from the diminution of the perceptions and memory through extreme old age.

III. Amentia (*acquiſita*), recurring in people formerly of a ſound mind, from evident external cauſes.

Genus LXVI. Melancholia; a partial madneſs, without dyſpepſia.

Varying according to the different ſubjects concerning which the perſon raves; and thus it is,

1. With an imagination in the patient concerning his body being in a dangerous condition, from ſlight cauſes; or that his affairs are in a deſperate ſtate.

2. with an imagination concerning a proſperous ſtate of affairs.

3. With violent love, without ſatyriaſis or nymphomania.

4. With a ſuperſtitious fear of a future ſtate.

5. With an averſion from motion and all the offices of life.

6. With reſtleſſneſs, and an impatience of any ſituation whatever.

7. With a wearineſs of life.

8. With a deception concerning the nature of the patient's ſpecies.

Dr Cullen thinks that there is no ſuch diſeaſe as that called *dæmonomania*, and that the diſeaſes mentioned by Sauvages under that title are either,

1. Species of melancholy or mania; or

2. Of ſome diſeaſe by the ſpectators falſly aſcribed to the influence of an evil ſpirit; or

3. Of a diſeaſe entirely feigned; or

4. Of a diſeaſe partly true and partly feigned.

Genus LXVII. Mania; univerſal madneſs.

1. Mania (*mentalis*), ariſing entirely from paſſions of the mind.

2. Mania (*corporea*), from an evident diſeaſe of the body.

Varying according to the different diſeaſes of the body.

3. Mania (*obſcura*), without any paſſion of mind or evident diſeaſe of the body preceding.

The ſymptomatic ſpecies of mania are,

1. Paraphroſyne from poiſons.

2. Paraphroſyne from paſſion.

3. Paraphroſyne febrilis.

Genus LXVIII. Oneirodynia. A violent and troubleſome imagination in time of ſleep.

1. Oneirodynia (*activa*), exciting to walking and various motions.

2. Oneirodynia (*gravans*), from a ſenſe of ſome weight incumbent, and preſſing on the breaſt eſpecially.

General Arrangement of Diſeaſes.

CLASS III. Cachexiæ; a depraved habit of the whole or greateſt part of the body, without primary pyrexia or neuroſis.

Order I. Marcores; a waſting of the whole body.

Genus LXIX. Tabes. Leanneſs, aſthenia, hectic pyrexia. The ſpecies are,

1. Tabes (*purulenta*), from an external or internal ulcer, or from a vomica

Varying in its ſituation: hence,

2. Tabes (*ſcrophuloſa*), in ſcrophulous conſtitutions

3. Tabes (*venenata*), from poiſon taken inwardly.

Genus LXX. Atrophia. Leanneſs and aſthenia, without hectic pyrexia. The ſpecies are.

1. Atrophia (*inanitorum*), from too great evacuation.

2. Atrophia (*famelicorum*), from a deficiency of nouriſhment.

3. Atrophia (*cacochymia*), from corrupted nouriſhment.

4. Atrophia (*debilium*), from the function of nutrition being depraved, without any extraordinary evacuation or cacochymia having preceded.

Order II. Intumeſcentiæ. An external tumor of the whole or greateſt part of the body.

Sect I. *Adipoſæ.*

Genus LXXI. Polyſarcia; a troubleſome ſwelling of the body from fat.

Sect. II. *Flatuoſæ.*

Genus LXXII. Pneumatoſis; a tenſe elaſtic ſwelling of the body, crackling under the hand. The ſpecies are,

1. Pneumatoſis (*ſpontanea*), without any manifeſt cauſe.

2. Pneumatoſis (*traumatica*), from a wound in the breaſt.

3. Pneumatoſis (*venenata*), from poiſon injected or applied.

4. Pneumatoſis (*hyſterica*), with hyſteria.

Genus LXXIII. Tympanites; a tenſe, elaſtic, ſonorous ſwelling of the abdomen; coſtiveneſs; a decay of the other parts. The ſpecies are,

1. Tympanites (*inteſtinalis*), with a tumor of the abdomen frequently unequal, and with a frequent evacuation of air relieving the tenſion and pain.

2. Tympanites (*abdominalis*), with a more evident noiſe, a more equable tumor, and a leſs frequent emiſſion of flatus, which alſo gives leſs relief.

Genus LXXIV. Phyſometra; a ſlight elaſtic ſwelling in the epigaſtrium, having the figure and ſituation of the uterus.

Sect. III *Aquoſæ or Hydropes.*

Genus LXXV. Anaſarca. A ſoft, inelaſtic ſwelling of the whole body, or ſome part of it. The ſpecies are,

1. Anaſarca (*ſeroſa*), from a retention of ſerum on account of the ſuppreſſion of the uſual evacuations, or from an increaſe of the ſerum on account of too great a quantity of water taken inwardly.

2. Anaſarca. (*oppilata*), from a compreſſion of the veins.

3. Anaſarca (*exanthematica*), ariſing after exanthemata, eſpecially after the eryſipelas.

General Arrangement of Diſeaſes.

4. Anaſarca (*anæmica*), from the thinneſs of the blood produced by hemorrhagy.

5. Anaſarca (*debilium*), in weak people after long diſeaſes, or from other cauſes.

Genus LXXVI. Hydrocephalus. A ſoft inelaſtic ſwelling of the head, with the ſutures of the cranium opened.

Genus LXXVII. Hydrorachitis. A ſoft, ſlender tumor above the vertebræ of the loins; the vertebræ gaping from each other.

Genus LXXVIII. Hydrothorax. Dyſpnœa; paleneſs of the face; œdematous ſwellings of the feet; ſcanty urine; lying down difficult; a ſudden and ſpontaneous waking out of ſleep, with palpitation; water fluctuating in the breaſt.

Genus LXXIX. Aſcites. A tenſe, ſcarce elaſtic, but fluctuating ſwelling of the abdomen. The ſpecies are,

1. Aſcites (*abdominalis*), with an equal ſwelling of the whole abdomen, and with a fluctuation ſufficiently evident.

Varying according to the cauſe.

A, From an obſtruction of the viſcera.

B, From debility.

C, From a thinneſs of the blood.

2, Aſcites (*ſaccatus*), with a ſwelling of the abdomen, in the beginning at leaſt, partial, and with a leſs evident fluctuation.

Genus LXXX. Hydrometra. A ſwelling of the hypogaſtrium in women, gradually increaſing, keeping the ſhape of the uterus, yielding to preſſure, and fluctuating; without iſchuria or pregnancy.

Genus LXXXI. Hydrocele. A ſwelling of the ſcrotum, not painful: increaſing by degrees, ſoft, fluctuating, and pellucid.

Sect. IV. *Solids.*

Genus LXXXII. Phyſconia. A ſwelling chiefly occupying a certain part of the abdomen, gradually increaſing, and neither ſonorous nor fluctuating. The ſpecies are.

Phyſconia hepatica.
Phyſconia ſplenica.
Phyſconia renalis.
Phyſconia uterina.
Phyſconia ab ovario,
Phyſconia meſenterica.
Phyſconia inteſtinalis.
Phyſconia omentalis.
Phyſconia polyſplachna.
Phyſconia viſceralis.
Phyſconia externa lupialis.
Phyſconia externa ſcirrhodea.
Phyſconia externa hydatidoſa.
Phyſconia ab adipe ſubcutaneo.
Phyſconia ab excreſcentia.

Genus LXXXIII. Rachitis. A large head, ſwelling moſt in the forepart, the ribs depreſſed; abdomen ſwelled, with a decay of the other parts.

Varying.

1. Simple, without any other diſeaſe.

2. Joined with other diſeaſes.

Order III. Impetigines. Cachexies chiefly deforming the ſkin and external parts of the body.

General Arrangement of Diſeaſes.

Genus LXXXIV. Scrophula. Swellings of the conglobate glands, eſpecially upon the neck; ſwelling of the upper lip and ſupport of the noſe; the face florid, ſkin thin, abdomen ſwelled. The ſpecies are,

1. Scrophula (*vulgaris*), ſimple, external, and permanent.

2. Scrophula (*meſenterica*), ſimple, internal, with paleneſs of the face, want of appetite, ſwelling of the abdomen, and unuſual fetor of the excrements.

3. Scrophula (*fugax*), moſt ſimple, appearing only about the neck; for the moſt part proceeding from the reſorption of the matter of ulcers in the head.

4. Scrophula (*Americana*), joined with the yaws.

Genus LXXXV. Syphilis. A contagious diſeaſe, after impure venery, and a diſorder of the genitals; ulcers of the tonſils; of the ſkin, eſpecially about the margin of the hair; corymboſe papulæ, ending in cruſts and cruſty ulcers; pains of the bones; exoſtoſes.

Genus LXXXVI. Scorbutus; in cold countries, attacking after putreſcent diet, eſpecially ſuch as is ſalt and of the animal kind, where no ſupply of freſh vegetables is to be had; aſthenia; ſtomacace; ſpots of different colours on the ſkin, for the moſt part livid, and appearing chiefly among the roots of the hair.

Varying in degree.

a, Scorbutus incipiens.

b, Scorbutus creſcens.

c, Scorbutus inveteratus.

Varying alſo in ſymptoms.

d, Scorbutus lividus.

e, Scorbutus petechialis.

f, Scorbutus pallidus.

g, Scorbutus ruber.

h, Scorbutus calidus.

Genus LXXXVII. Elephantiaſis; a contagious diſeaſe; thick, wrinkled, rough, unctuous ſkin, deſtitute of hairs, anæſthesia in the extremities, the face deformed with pimples, the voice hoarſe and naſal.

Genus LXXXVIII. Lepra; the ſkin rough, with white, branny, and chopped eſchars, ſometimes moiſt beneath, with itching.

Genus LXXXIX. Frambœſia; ſwellings reſembling fungi, or the fruit of the mulberry or raſpberry, growing on various parts of the ſkin.

Genus XC. Trichoma; a contagious diſeaſe; the hairs thicker than uſual, and twiſted into inextricable knots and cords.

Genus XCI. Icterus; yellowneſs of the ſkin and eyes; white fæces; urine of a dark red, tinging what is put into it of a clay colour.

The idiopathic ſpecies are,

1. Icterus (*calculoſus*), with acute pain in the epigaſtric region, increaſing after meals; biliary concretions voided by ſtool.

2. Icterus (*ſpaſmodicus*), without pain, after ſpaſmodic diſeaſes and paſſions of the mind.

3. Icterus (*hepaticus*), without pain, after diſeaſes of the liver.

4. Icterus (*gravidarum*), ariſing during the time of pregnancy, and going off after delivery.

5. Icterus (*infantum*), coming on in infants a few days after birth.

CLASS

General Arrangement of Diſeaſes.

CLASS IV. Locales. An affection of ſome part, but not of the whole body.

Order I. Dyſetheſiæ. The ſenſes depraved or deſtroyed, from a diſeaſe of the external organs.

Genus XCII. Caligo. The ſight impaired or totally deſtroyed, on account of ſome opaque ſubſtance interpoſed between the objects and the retina, inherent in the eye itſelf or the eye-lids. The ſpecies are,

1. Caligo (*lentis*), occaſioned by an opaque ſpot behind the pupil.

2. Caligo (*corneæ*), from an opacity of the cornea.

3. Caligo (*pupillæ*), from an obſtruction of the pupil.

Varying according to the different cauſes from which it proceeds.

4. Caligo (*humorum*,) from a diſeaſe or defect of the aqueous humour.

Varying according to the different ſtate of the humour.

5. Caligo (*palpebrarum*), from a diſeaſe inherent in the eye-lids.

Varying according to the nature of the diſeaſe in the eye-lids.

Genus XCIII. Amauroſis. The ſight diminiſhed, or totally aboliſhed, without any evident diſeaſe of the eye; the pupil for the moſt part remaining dilated and immoveable. The ſpecies are,

1. Amauroſis (*compreſſionis*), after the cauſes and attended with the ſymptoms of congeſtion in the brain.

Varying according to the nature of the remote cauſe.

2. Amauroſis (*atonica*), after the cauſes and accompanied with ſymptoms of debility.

3. Amauroſis (*ſpaſmodica*), after the cauſes and with the ſigns of ſpaſm.

4. Amauroſis (*venenata*), from poiſon taken into the body or applied outwardly to it.

Genus XCIV- Dyſopia. A depravation of the ſight, ſo that objects cannot be diſtinctly perceived, except at a certain diſtance, and in a certain ſituation. The ſpecies are,

1. Dyſophia (*tenebrarum*), in which objects are not ſeen unleſs they be placed in a ſtrong light.

2. Dyſopia (*luminis*), in which objects are not diſtinctly ſeen unleſs by a weak light.

3. Dyſopia (*diſſitorum*), in which diſtant objects are not perceived.

4. Dyſopia (*proximorum*), in which the neareſt objects are not perceived.

5. Dyſopia (*lateralis*), in which objects are not perceived unleſs placed in an oblique poſture.

Genus XCV. Pſeudoblepſis; when the ſight is diſeaſed in ſuch a manner that the perſon imagines he ſees things which really do not exiſt, or ſees things which do exiſt after ſome other manner than they really are. The ſpecies are,

1. Pſeudoblepſis (*imaginaria*), in which the perſon imagines he ſees things which really do not exiſt.

Varying according to the nature of the imagination.

2. Pſeudoblepſis (*mutans*), in which objects really exiſting appear ſomehow changed.

Varying according to the change perceived in the objects, and according to the remote cauſe.

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Genus XCVI. Dyſecœa. A dimunition or total abolition of the ſenſe of hearing. The ſpecies are,

1. Dyſecœa (*organica*), from a diſeaſe in the organs tranſmitting ſounds to the internal ear.

Varying according to the nature of the diſeaſe of the part affected.

2. Dyſecœa (*atonica*), without an evident diſeaſe of the organs tranſmitting the ſounds.

Varying according to the nature of the cauſe.

Genus XCVII. Paracuſis; a depravation of the hearing. The ſpecies are,

1. Paracuſis (*imperfecta*), in which though ſounds coming from external objects are heard, yet it is neither diſtinctly nor in the uſual manner.

Varying.

a, With a dulneſs of hearing.

b, With an hearing too acute and ſenſible.

c, When a ſingle external ſound is doubled by ſome internal cauſes.

d, When the ſounds which a perſon deſires to hear are not perceived, unleſs ſome other violent ſound is raiſed at the ſame time.

2. Paracuſis (*imaginaria*), in which ſounds not exiſting externally are excited from internal cauſes.

Varying according to the nature of the ſound perceived, and according to the nature of the remote cauſe.

Genus XCVIII. Anoſmia; a dimunition or abolition of the ſenſe of ſmell. The ſpecies are,

1. Anoſmia; (*organica*), from a diſeaſe in the membrane lining the internal parts of the noſtrils.

Varying according to the nature of the diſeaſe.

2. Anoſmia (*atonica*), without any evident diſeaſe of the membrane of the noſe.

Genus XCIX. Agheuſtia; a dimunition or abolition of the ſenſe of taſte.

1. Agheuſtia (*organica*), from a diſeaſe of the membrane of the tongue, keeping off from the nerves thoſe ſubſtances which ought to produce taſte.

2. Agheuſtia (*atonica*), without any evident diſeaſe of the tongue.

Genus C. Anæſtheſia; a dimunition or abolition of the ſenſe of feeling. The ſpecies from Sauvages, adopted by Dr Cullen, are,

1. Anæſtheſia a ſpina bifida.
2. Anæſtheſia plethorica.
3. Anæſtheſia naſcentium.
4. Anæſtheſia melancholica.

Order II. Dyſorexia; error or defect of appetite.

Sect. I. Appetitus erronei.

Genus CI. Bulimia: a deſire for food in greater quantities than can be digeſted.

The idiopathic ſpecies are,

1. Bulimia (*helluonum*), an unuſual appetite for food, without any diſeaſe of the ſtomach.

2. Bulimia (*ſyncopalis*), a frequent deſire of meat, on account of a ſenſation of hunger threatening ſyncope.

5. Bulimia (*emetica*), an appetite for a great quantity of meat, which is thrown up immediately after it is taken.

Genus CII. Polydipſia; an appetite for an unuſual quantity of drink.

The polydipſia is almoſt always ſymptomatic, and varies

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varies only according to the nature of the diſeaſe which accompanies it.

Genus CIII. Pica; a deſire of ſwallowing ſubſtances not uſed as food.

Genus CIV. Satyriaſis: an unbounded deſire of venery in men. The ſpecies are,

1. Satyriaſis (*juvenilis*), an unbounded deſire of venery, the body at the ſame time being little diſordered.

2. Satyriaſis *(furens)*, a vehement deſire of venery, with a great diſorder of the body at the ſame time.

Genus CV. Nymphomania; an unbounded deſire of venery in women.

Varying in degree.

Genus CVI. Noſtalgia; a violent deſire in thoſe who are abſent from their country of reviſiting it.

1. Noſtalgia (*ſimplex*), without any other diſeaſe.

2. Noſtalgia (*complicata*), accompanied with other diſeaſes.

Sect. II. Appetitus deficientes.

Genus CVII. Anorexia. Want of appetite for food. Always ſymptomatic.

1. Anorexia (*humoralis*), from ſome humour loading the ſtomach.

2. Anorexia (*atonica*), from the tone of the fibres of the ſtomach being loſt.

Genus CVIII. Adipſia; a want of thirſt. Always a ſymptom of ſome diſeaſe affecting the ſenſorium commune.

Genus CIX. Anaphrodiſia; want of deſire for, or impotence to, venery.

The true ſpecies are,

1. Anaphrodiſia paralytica.

2. Anaphrodiſia gonorrhoica.

The falſe ones are,

1. Anaphrodiſia a mariſcis.

2. Anaphrodiſia ab urethræ vitio.

ORDER III. Dyſcineſiæ. An impediment, or depravation of motion from a diſorder of the organs.

Genus CX. Aphonia; a total ſuppreſſion of voice without coma or ſyncope. The ſpecies are,

1. Aphonia (*gutturalis*), from the fauces or glottis being ſwelled.

2. Aphonia (*trachealis*), from a compreſſion of the trachea.

3. Aphonia (*atonica*), from the nerves of the larynx being cut.

Genus CXI. Mutitas; want of power to pronounce words. The ſpecies are,

1. Mutitas (*organica*), from the tongue being cut out or deſtroyed.

2. Mutitas (*atonica*), from the injuries done to the nerves of the tongue.

3. Mutitas (*ſurdorum*), from people being born deaf, or the hearing being deſtroyed during childhood.

Genus CXII. Paraphonia a depraved ſound of the voice. The ſpecies are,

1. Paraphonia (*puberum*), in which, about the time of puberty, the voice from being acute and ſweet, becomes more grave and harſh.

2. Paraphonia (*rauca*), in which, by reaſon of the dryneſs or flaccid tumor of the fauces, the voice becomes rough and hoarſe.

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3. Paraphonia (*reſonans*), in which, by reaſon of an obſtruction in the noſtrils, the voice becomes hoarſe, with a ſound hiſſing through the noſtrils.

4. Paraphonia (*palatina*), in which, on account of a defect or diviſion of the uvula, for the moſt part with an hare-lip, the voice becomes obſcure, hoarſe, and unpleaſant.

5. Paraphonia (*clangens*), in which the voice is changed to one acute, ſhrill, and ſmall.

6. Paraphonia (*comatoſa*, in which, from a relaxation of the velum palati and glottis, a ſound is produced during inſpiration.

Genus CXIII. Pſelliſmus; a defect in the articulation of words. The ſpecies are,

1. Pſelliſmus (*hæſitans*), in which the words, eſpecially the firſt ones of a diſcourſe, are not eaſily pronounced, and not without a frequent repetition of the firſt ſyllable.

2. Pſelliſmus (*ringens*), in which the ſound of the letter R is always aſpirated, and, as it were, doubled.

3. Pſelliſmus (*lallans*), in which the ſound of the letter L becomes more liquid, or is pronounced inſtead of R.

4. Pſelliſmus (*emolliens*), in which the hard letters are changed into the ſofter ones, and thus the letter S is much uſed.

5. Pſelliſmus (*balbutiens*), in which, by reaſon of the tongue being large, or ſwelled, the labial letters are better heard, and often pronounced inſtead of others.

6. Pſelliſmus (*acheilos*), in which the labial letters cannot be pronounced at all, or with difficulty.

7. Pſelliſmus (*logoſtomatum*), in which, on account of the diviſion of the palate, the guttural letters are leſs perfectly pronounced.

Genus CXIV. Strabiſmus, the optic axes of the eyes not converging. The ſpecies are,

1. Strabiſmus (*habitualis*), from a bad cuſtom of uſing only one eye.

2. Strabiſmus (*commodus*), from the greater debility or mobility of one eye above the other; ſo that both eyes cannot be conveniently uſed.

3. Strabiſmus (*neceſſarius*), from a change in the ſituation or ſhape of the parts of the eye.

Genus CXV. Contractura; a long-continued and rigid contraction of one or more limbs. The ſpecies are,

1. Contractura (*primaria*), from the muſcles becoming contracted and rigid.

a, From the muſcles becoming rigid by inflammation.

b, From muſcles becoming rigid by ſpaſm.

c, From muſcles contracted by reaſon of their antagoniſts having become paralytic.

d, From muſcles contracted by an irritating acrimony.

2. Contractura (*articularis*), from ſtiff joints.

ORDER IV. Apocenoſes. A flux either of blood or ſome other humour flowing more plentifully than uſual, without pyrexia, or an increaſed impulſe of fluids.

Genus CXVI. Profuſio; a flux of blood.

Genus CXVII. Ephidroſis; a preternatural evacuation of ſweat.

Symptomatic ephidroſes vary according to the nature of the diſeaſes which they accompany, the different nature of the ſweat itſelf, and ſometimes the different parts of the body which ſweats moſt.

Genus CXVIII. Epiphora; a flux of the lacrymal humour.

Genus CXIX. Ptyaliſmus; a flux of ſaliva.

Genus CXX. Enureſis; an involuntary flux of urine without pain. The ſpecies are,

1. Enureſis (*atonica*), after diſeaſes injuring the ſphincter of the bladder.

2. Enureſis (*irritata*), from a compreſſion or irritation of the bladder.

Genus CXXI. Gonorrhœa; a preternatural flux of humour from the urethra in men, with or without a deſire of venery. The ſpecies are,

1. Gonorrhœa (*pura*) in which, without any impure venery having preceded, a humour reſembling pus, without diſuria or propenſity to venery, flows from the urethra.

2. Gonorrhœa (*impura*), in which, after impure venery, an humour like pus flows from the urethra with dyſuria. The conſequence of this is,

Gonorrhœa (*mucoſa*), in which, after an impure gonorrhœa, a mucous humour flows from the urethra with little or no dyſuria.

3. Gonorrhœa (*laxorum*), in which an humour for the moſt part pellucid, without any erection of the penis, but with a propenſity to venery, flows from the urethra while the perſon is awake.

4. Gonorrhœa (*dormientium*), in which the ſeminal liquor is thrown out, with erection and deſire of venery, in thoſe who are aſleep and have laſcivious dreams.

Order V. Epiſcheſes; ſuppreſſions of evacuations.

Genus CXXII. Obſtipatio; the ſtools either ſuppreſſed or ſlower than uſual. The ſpecies are,

1. Obſtipatio (*debilium*), in lax, weak and for the moſt part dyſpeptic perſons.

2. Obſtipatio (*rigidorum*), in people whoſe fibres are rigid, and frequently of an hypochondriac diſpoſition.

3. Obſtipatio (*obſtructorum*), with ſymptoms of the colica 1ſt, 2d, 4th, and 7th, abovementioned.

Genus CXXIII. Iſchuria; an abſolute ſuppreſſion of urine. The ſpecies are,

1. Iſchuria (*renalis*), coming after a diſeaſe of the kidneys, with pain, or troubleſome ſenſe of weight in the region of the kidneys, and without any ſwelling of the hypogaſtrium, or deſire of making water.

2. Iſchuria (*ureterica*), coming after a diſeaſe of the kidneys, with a ſenſe of pain or uneaſineſs in ſome part of the ureter, and without any tumor of the hypogaſtrium, or deſire of making water.

3. Iſchuria (*veſicalis*), with a ſwelling of the hypogaſtrium, pain at the neck of the bladder, and a frequent ſtimulus to make water.

4. Iſchuria (*urethralis*), with a ſwelling of the hypogaſtrium, frequent ſtimulus to make water, and pain in ſome part of the urethra.

All theſe ſpecies are ſubdivided into many varieties, according to their different cauſes.

Genus CXXIV. Dyſuria; a painful, and ſomehow impeded emiſſion of urine. The ſpecies are,

1. Dyſuria (*ardens*), with heat of water, without any manifeſt diſorder of the bladder.

2. Dyſuria (*ſpaſmodica*), from a ſpaſm communicated from the other parts to the bladder.

3. Dyſuria (*compreſſionis*), from the neighbouring parts preſſing upon the bladder.

4. Dyſuria (*phlogiſtica*), from an inflammation of the neighbouring parts.

5. Dyſuria (*irritata*), with ſigns of a ſtone in the bladder.

6. Dyſuria (*mucoſa*), with a copious excretion of mucus.

Genus CXXV. Dyſpermatiſmus; a flow, impeded, and inſufficient emiſſion of ſemen in the venereal act. The ſpecies are.

1. Dyſpermatiſmus (*urethralis*), from diſeaſes of the urethra.

2. Dyſpermatiſmus (*nodoſus*), from knots on the cavernous bodies.

3. Dyſpermatiſmus (*præputialis*), from too narrow an orifice of the prepuce.

4. Dyſpermatiſmus (*mucoſus*), from mucus infarcting the urethra.

5. Dyſpermatiſmus (*hypertonicus*), from too ſtrong an erection of the penis.

6. Dyſpermatiſmus (*epilepticus*), from a ſpaſmodic epilepſy happening during the time of coition.

7. Dyſpermatiſmus (*apractodes*), from an imbecility of the parts of generation.

8. Dyſpermatiſmus (*refluus*), in which there is no emiſſion of ſemen, becauſe it returns from the urethra into the bladder.

Genus CXXVI. Amenorrhœa. The menſes either flowing more ſparingly than uſual, or not at all, at their uſual time, without pregnancy. The ſpecies are,

1. Amenorrhœa (*emanſionis*), In thoſe arrived at puberty, in whom, after the uſual time, the menſes have not yet made their appearance, and many different morbid affections have taken place.

2. Amenorrhœa (*ſuppreſſionis*), in adults, in whom the menſes which had already begun to flow are ſuppreſſed.

3. Amenorrhœa (*difficilis*), in which the menſes flow ſparingly, and with difficulty.

Order VI. Tumores; and increaſed magnitude of any part without phlogoſis.

Genus CXXVII. Aneuriſma; a ſoft tumour, with pulſation, above an artery,

Genus CXXVIII. Varix; a ſoft tumor, without pulſation, above a vein.

Genus CXXIX. Ecchymoma,, a diffuſed, and ſcarce eminent, livid tumor.

Genus CXXX. Scirrhus; an hard tumor of ſome part, generally of a gland, without pain, and difficultly brought to ſuppuration.

Genus CXXXI. Cancer. A painful tumor of a ſcirrhous nature, and degenerating into an ill-conditioned ulcer.

Genus CXXXII. Bubo; a ſuppurating tumor of a conglobate gland.

Genus CXXXIII. Sarcoma; a ſoft ſwelling, without pain.

Genus CXXXIV. Verruca; a harder ſcabrous ſwelling.

Genus CXXXV. Clavus; a hard, lamellated thickneſs of the ſkin.

Genus CXXXVI. Lupia. A moveable, ſoft tumour below the ſkin, without pain.

Genus CXXXVII. Ganglion. An harder moveable ſwelling, adhering to a tendon.

Genus CXXXVIII. Hydatis; a cuticular veſicle filled with aqueous humour.

Genus CXXXIX. Hydarthrus; a moſt painful ſwelling of the joints, chiefly of the knee, at firſt ſcarce elevated, of the ſame colour with the ſkin, diminiſhing the mobility.

Genus CXL. Exoſtoſis; a hard tumor adhering to a bone.

Order VII. Ectopiæ; tumors occaſioned by the removal of ſome part out of its proper ſituation.

Genus CXLI. Hernia; an ectopia of a ſoft part as yet covered with the ſkin and other integuments.

Genus CXLII. Prolapſus; a bare ectopia of ſome ſoft part.

Genus CXLIII. Luxatio; the removal of a bone from its place in the joints.

Order VIII. Dialyſes. A ſolution of continuity; manifeſt to the ſight or touch.

Genus CXLIV. Vulnus; a recent and bloody ſolution of the unity of ſome ſoft part by the motion of ſome hard body.

Genus CXLV. Ulcus. A purulent or ichorous ſolution of a ſoft part.

Genus CXLVI. Herpes; a great number of phlyctenæ or ſmall ulcers, gathering in cluſters, creeping, and obſtinate.

Genus CLXVII. Tinea; ſmall ulcers among the roots of the hair of the head, pouring out a humour which changes to a white friable ſcurf.

Genus CXLVIII. Pſora. Itchy puſtules and little ulcers of an infectious nature, chiefly infeſting the hands.

Genus CXLIX. Fractura; bones broken into large fragments.

Genus CL. Caries an exulceration of a bone.

Having thus preſented to our readers Dr Cullen's general ſyſtematic view of all the diſeaſes to which the human body is ſubjected, we come next to give a more particular account of the more important affections, treating of them in the order which Dr Cullen has arranged them.

Class I. PYREXIÆ, or the Febrile Diſeaſes. 124

Order I. FEBRES, Or Fevers ſtrictly ſo called.

125 *Sauvag.* Claſs II. *Vog.* Claſs I. *Sagar.* Claſs XII. Morbi Febriles Critici, *Lin.* Claſs II.

Sect. I. INTERMITTENTS.

Intermittentes of ſome authors; *Sauv.* Claſs II. Order III. *Lin.* Claſs II. Order II. *Vog.* Claſs I. Order I. *Sag.* Claſs XII. Order III.

The *remittentes* of others, *Sauv.* Claſs II. Order II. *Sag.* Claſs XII. Order II.

Exacerbantes, *Lin.* Claſs II. Order III.

Continuæ, *Vog.* Claſs I. Order II.

Genus I. TERTIANA; the Tertian Fever.

(*Tertiana*, Sauv. G. 88. Lin. 16. Hoffm. Stahl. Cleghorn. Senac.)

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The *Genuine* Tertian.

(Tertiana legitima, *Senert. Hoffm. Cleghorn,* Minorc. *Sauv.* Sp. I.)

1. *Deſcription.* This diſeaſe, in its moſt regular form, conſiſts of repeated paroxiſms, returning every ſecond day, the patient during the intermediate period enjoying apparently a ſtate of good health. This is the moſt common form of ague, as it is commonly called in Britain. Each paroxyſm conſiſts of three parts, the cold, the hot, and the ſweating ſtages. The paroxyſm commonly begins with a remarkable ſhivering, increaſing frequently to a convulſive ſhaking of the limbs. The extremities are always cold, ſometimes remarkably ſo. The cold for the moſt part is firſt perceived about the lumbar regions, from thence aſcending along the ſpine turns toward the pit of the ſtomach. Sometimes it begins in the firſt joint of the fingers and tip of the noſe. Sometimes it attacks only a particular part of the body, as one of the arms, the ſide of the head, &c. This cold is often preceded by a heavy and ſleepy torpor, languor, and laſſitude, which we are partly to aſcribe to real weakneſs and partly to mere lazineſs. To theſe ſymptoms ſucceed yawning and ſtretching; after which the cold comes on as above deſcribed, not unfrequently with a pain of the back, and a troubleſome ſenſation of tenſion in the precordia and hypochondria. To this ſucceed nauſea and vomiting: and the more genuine the diſeaſe the more certainly does the vomiting come on; by which a great deal of tough mucous matter, and ſometimes bilious ſtuff or indigeſted food is evacuated during the firſt paroxyſms. In ſome there is only a violent ſtraining to vomit, without bringing up any thing: ſometimes, inſtead of theſe ſymptoms, a Diarrhœa occurs; and this chiefly in weak, phlegmatic, and aged people, or where an indigeſted mucous ſaburra has long remained in the primæ viæ

When theſe ſymptoms have continued for an hour or two, the cold begins to go off, and is ſucceeded by a laſſitude, languor, and flaccidity of the whole body, but chiefly in the limbs, with an uneaſy ſoreneſs as if the parts had been bruiſed; excepting in thoſe caſes where the nauſea continues for a longer time. After this langour, a heat comes on, the increaſe of which is generally ſlow, but ſometimes otherwiſe, with pain of the head, thirſt, and bitterneſs in the mouth. The pulſe is quick and unequal; ſometimes beating 130 ſtrokes in a minute. As ſoon as this heat has abated, a little moiſture or ſweat is obſerved to break forth; not always indeed in the firſt, but always in the ſucceeding paroxyſms, and the urine lets fall a quantity of lateritious ſediment. The whole paroxyſm is ſcarce ever over in leſs than ſix hours, more frequently eight, and in violent caſes extends to 12 hours; but that which exceeds 12 hours is to be reckoned a ſpurious kind, and approaching to the nature of continued fevers. All theſe ſymptoms, however, are repeated every ſecond day, in ſuch a manner that the patient is quite free from fever for at leaſt 24 hours. The paroxyſms return much about the ſame time, though ſometimes a little ſooner or later.

3. *Cauſes of this diſeaſe, and perſons ſubject to it.* The genuine tertian attacks men rather than women, young people rather than old; the latter being more ſubject to anomalous tertians. It likewiſe ſeizes the luſty and active, rather than the lazy and indolent. Thoſe, however, who are apt to nauſeate their meat, fall eaſily into a tertian fever. The cauſe, according to Dr Cullen, is the miaſma of marſhes, and that only. Other phyſicians have taken in many more cauſes, almoſt every thing indeed which debilitates the body: but the Doctor denies that any of theſe, though they may diſpoſe the body for receiving the diſeaſe, or may augment it, can by any means produce it without the concurrence of the marſh miaſma; and it cannot be denied, that it is a diſeaſe almoſt peculiar to marſhy ſituations. Thus we find it very frequent in the fenny counties of Britain, although in other parts of the iſland it may be conſidered as a rare diſeaſe.

3. *Prognoſis.* The genuine ſimple tertian, unleſs improper medicines be adminiſtered, is generally very eaſily cured; nay, the vulgar reckon it of ſuch a ſalutary nature, that after it they imagine a perſon becomes more ſtrong and healthy than before. Hippocrates has obſerved, that theſe fevers terminate of their own accord after ſeven or nine paroxyſms. Juncker tells us, that it frequently terminates before the ſeventh paroxyſm, but rarely before the fourth. He alſo denies that any thing critical is to be obſerved in its going off; but in this he differs from Vogel, who tells us, that the urine, for ſome days after the fever is quite gone off, appears ſlimy, and lets fall much ſediment. The latter alſo informs us, that beſides the common criſis by ſweat and urine, the tertian hath one peculiar to itſelf, namely, dry ſcabby ulcers breaking out upon the lips. Theſe ſometimes appear about the third or fourth paroxyſm; and then we may venture to foretel that the diſeaſe will go off ſpontaneouſly after the ſeventh. But though the diſeaſe be never dangerous, in cold climates at leaſt, when properly treated; yet the improper uſe of hot and ſtimulating medicines may change it into a continued fever, more or leſs dangerous according to the quantity of medicines taken and the conſtitution of the patient; in which caſe the prognoſis muſt be regulated by the particular ſymptoms which occur. In warm climates, however, the tertian fever may be conſidered as a much more dangerous diſeaſe; and unleſs the moſt powerful remedies be employed, the patient is in danger of falling a victim to every paroxyſm.

A variety of theories have been propoſed for explaining the phenomena of this affection; but we may eaſily aſſert, that every thing hitherto ſaid upon the ſubject is highly unſatisfactory. For although it be now almoſt univerſally admitted, that this fever does ariſe from the effluvia of marſhes, yet in what manner the action of thoſe effluvia induces fever, and particularly why this fever returns in regular paroxyſms, are queſtions with regard to which we are ſtill totally in the dark. Dr Cullen, with much ingenuity, attempted to prove, that the remote cauſes of this; as well as of other fevers, operated by inducing a ſtate of debility; that this debility gives riſe to ſpaſm, induces increaſed action, from which the phenomena are to be explained. But this theory is liable to no leſs numerous and unſurmountable objections than the exploded hypotheſes which had before been propoſed by others. For it is an undeniable truth, that debility often exiſts, even to the higheſt imaginable degree, without any fever; nay, that when fever has taken place, the debility is often much greater after it is entirely gone than at any period during its courſe. When ſpaſm and increaſed action do take place, we have no reaſon to view them in any other light than merely as ſymptoms of the diſeaſe; and while they are often abſent in this affection, they frequently occur in others where the ſickneſs, anxiety, and other characteriſing ſymptoms of fever are entirely abſent; and, upon the whole, a probable or rational theory of intermittents, as well as of other fevers, ſtill remains to be diſcovered.

Cure. The treatment of all genuine intermittents, whether *tertians*, quotidians, or quartans, being almoſt preciſely the ſame, the general method of cure applicable to them all may be here given, to which it will be eaſy to refer when we come to deſcribe the others.

In treating intermittent fevers, phyſicians have formed indications of cure according to their different theories. The followers of Boerhaave, Stahl, &c. who imagined that the diſeaſe proceeded from a lentor or other diſorders in the blood, always thought it neceſſary to correct and evacuate theſe peccant humours by emetics and purgatives before they attempted to ſtop the diſeaſe by the peruvian bark or any other medicine. The bark, indeed, among ſome, ſeems to be held in very little eſtimation by them; ſince Vogel affirms, that this medicine, inſtead of deſerving to have the preference of all other febrifuge medicines, ought rather to be ranked among the loweſt of the whole; and for this reaſon he aſcribes the cures, ſaid to be obtained by the uſe of the Peruvian bark, entirely to nature.

According to Dr Cullen, the indications of cure in intermitting fevers may be reduced to the following.

1. In the time of intermiſſion, to prevent the return of the paroxyſms.

2. In the time of paroxyſms, to conduct theſe in ſuch a manner as to obtain a final ſolution of the diſeaſe.

3. To take off certain circumſtances which might prevent the fulfilling of the two firſt indications.

The firſt indication may be anſwered in two ways. 1. By increaſing the action of the heart and arteries ſome time before the period of acceſſion, and ſupporting that increaſed action till the period of acceſſion be over, and thus to prevent the recurrence of that atony. and ſpaſm of the extreme veſſels, which he thinks give occaſion to the recurrence of paroxiſms. 2. By ſupporting the tone of the veſſels, and thereby preventing atony and the conſequent ſpaſm, without increaſing the action of the heart and arteries, the recurrence of paroxyſms may be prevented.

The action of the heart and arteries may be increaſed, 1. By various ſtimulent remedies internally given or externally applied, and that without exciting ſweat. 2. By the ſame remedies, or others, managed in ſuch a manner as to excite ſweating and to ſupport that ſweating till the period of acceſſion be for ſome time paſt. 3. By emetics, ſupporting for the ſame time the tone and action of the extreme veſſels.

The tone of the extreme veſſels may be ſupported without increaſing the action of the heart and arteries, by various tonic medicines; as, 1. Aſtringents alone. 2. Bitters alone. 3. Aſtringents and bitters conjoined. 4. Aſtringents and aromatics conjoined. 5. Certain metallic tonics: and, 6. Opiates. A good deal of exerciſe, and as full a diet as the condition of the patient's appetite and digeſtion allow of will be proper during the time of intermiſſion, and may be conſidered as belonging to this head. Athough many particulars in this plan of cure are deduced from Dr Cullen's theory, yet there can be no doubt that the object chiefly to be aimed at is to employ ſuch remedies during the intermiſſions as will prevent a recurrence of the paroxyſm. Of all the remedies hitherto employed with this intention, the moſt celebrated, perhaps the moſt certainly effectual, is the Peruvian bark; or, to ſpeak more properly, the bark of the *cinchona officinalis* of Linnæus. But it muſt be obſerved that good effects are only to be expected from this medicine when given in ſubſtance and in large quantity; and for its uſe the following rules or obſervations have been given.

1. The bark may with ſafety be employed at any period of intermitting fevers, providing that at the ſame time there be neither a phlogiſtic diatheſis prevailing in the ſyſtem, nor any conſiderable or fixed congeſtion preſent in the abdominal viſcera.

2. The proper time for exhibiting the bark in intermittent fevers is during the time of intermiſſion, and it is to be abſtained from in the time of paroxyſms.

3. In the caſe of genuine intermittents, while a due quantity of bark is employed, the exhibition of it ought to be brought as near to the time of acceſſion as the condition of the patient's ſtomach will allow.

4. In all caſes of intermittents it is not ſufficient that the recurrence of paroxyſms be ſtopped for once by the uſe of the bark; a relapſe is commonly to be expected, and ſhould be prevented by the exhibition of the bark repeated at proper entervals.

The advantage of adminiſtering the bark as early as poſſible, was fully aſcertained by Dr Lind in the years 1765, 66, and 67, during an uncommon prevalence of intermittents. When the diſeaſe was ſtopped by the bark immediately after the firſt or ſecond fit, which was the caſe with 200 of the Doctor's patients as well as himſelf, neither a jaundice nor dropſy enſued; whereas, when the bark could not be adminiſtered, on account of the imperfect remiſſion of the fever, or when the patient had neglected to take it, either a dropſy, jaundice, or conſtant head-ach, were the certain conſequences; and the violence of the diſeaſe was in proportion to the number of the preceding fits, or to the continuance of the fever. By every paroxyſm the dropſical ſwellings were viſibly increaſed, and the colour of the ſkin rendered of a deeper yellow. When the fever continued a few days without remiſſion, the belly and legs generally ſwelled; a violent head-ach, likewiſe, and vertigo; for the moſt part diſtreſſed the patient; ſo that ſome, even after the fever had left them, were not able to walk acroſs their chamber for a fortnight or three weeks. When the returns of the fever were regular and even, but ſlight, four or five fits of a ſimple tertian were ſometimes followed by the moſt dangerous ſymptoms; eſpecially in the year 1765, when theſe fevers raged with the greateſt violence. If, as frequently happened, a dropſical patient relapſed into the ague, there was an abſolute neceſſity for putting an immediate ſtop to it by the bark; and in upwards of 70 ſuch patients, Dr Lind obſerved the moſt beneficial effects to accrue from this practice. He never preſcribed the bark until the patient was free from all ſymptoms of the fever; but in that caſe, without regard to a cough, or any other chronical indiſpoſition, he ordered it to be given in large doſes.

The bark has been often obſerved to fail in removing intermittents, from not continuing the uſe of it for a ſufficient length of time, from adminiſtering it in too ſmall a doſe, or from giving it in an improper form. It was a prevailing opinion, that an ounce, or an ounce and an half, of the bark, taken during one intermiſſion, is ſufficient to prevent the return of another paroxyſm. But this is not always the caſe; for a ſevere fit will often attack a patient who has taken ſuch a quantity. When this happens the patient ought to perſevere during the following intermiſſions, with an increaſe of the doſe, till five or ſix ounces at leaſt have been taken. The medicine alſo ought not to be omitted as ſoon as one fit is ſtopped, but ſhould be continued in a ſmaller doſe, and after longer intervals, for at leaſt ten days or a fortnight. Even for ſeveral months after the diſeaſe is entirely removed, it would be adviſable to take a little bark occaſionally in damp weather, or during an eaſterly wind, to prevent a relapſe. Where the intervals between the fits are ſhort, as in quotidians and double tertians, from one to two drachms of it ought to be taken every two or three hours.

The form in which this medicine is adminiſtered is of ſome conſequence. Mucilages and ſyrups have been recommended to conceal the taſte of it; but, from various experiments, Dr Lind found nothing more effectual for this purpoſe than ſmall-beer or milk, eſpecially the latter. A drachm of bark mixed with two ounces of milk, and quickly drank, may eaſily be taken by a perſon of the moſt delicate taſte, and by waſhing the mouth afterwards with milk there will not remain the leaſt flavour of the bark; but if the mixture be not drank immediately, the bark will impart a bitter taſte to the milk. This medicine is commonly given in electuaries or boluſes; but Dr Lind obſerves, that in theſe forms it proves much leſs efficacious than when adminiſtered in juleps or draughts, with the plentiful addition of wine or ſpirits. He has remarked, that ſix drachms of powdered bark, given in a julep, conſiſting of one fourth or one third of brandy, is as effectual as an ounce of the powder in the form of an electuary, and proves leſs diſagreeable to the ſtomach. For patients unaccuſtomed to wine or ſpirits, each draught ſhould be warmed with ſpiritus ſalis ammoniaci, or tinct. myrrh. by both of which the efficacy of the bark is increaſed. Dr Lind is alſo fully convinced that wine or ſpirits improve the virtues of the bark much more than elixir vitrioli, tinct. roſar. or ſuch other medicines as have been recommended by different phyſicians.

For thoſe who nauſeate the bark from a weakneſs of the ſtomach or other cauſe, he adviſes it to be given in clyſters, in which form it is as efficacious as when taken by the mouth. For this purpoſe the extract is moſt proper with the addition of a ſufficient quantity of the tinctura thebaica, in order to its being longer retained. For children labouring under intermitting fevers, Dr. Lind orders the ſpine of the back to be anointed at the approach of the fit, with a liniment compoſed of equal parts of tinctura thebaica and liniment ſapon, which has often prevented it. If this ſhould not produce the deſired effect, he informs us, that two or three tea-ſpoonfuls of ſyrup. e. mecon. given in the hot fit, will generally mitigate the ſymptoms. But for the entire removal of the diſeaſe, after purging with magneſia alba, he preſcribes a drachm of the extract. cort. Peruvian, with a few drops of tinct. thebaic. in a clyſter, to be repeated every three hours for a child of about a year old. When the ſtomach is oppreſſed with phlegm, the magneſia frequently occaſions vomiting, which ſhould be promoted with warm water. The conſtant heavineſs of the head occaſioned by thoſe fevers in ſuch tender conſtitutions is beſt relieved by the application of a bliſter to the back.

The bark has alſo proved effectual for the cure of intermittents in children, even when externally applied, by putting the powder of it into a quilted waiſtcoat. Of its efficacy in this way ſeveral inſtances are related by Dr Samuel Pye in the ſecond volume of Medical Obſervations and Inquiries. In ſhort, ſo effectual was the bark found in removing theſe fevers, when properly applied, that of between four and five hundred afflicted with them in the year 1765, Dr Lind loſt only two, neither of whom had taken this medicine.

In all theſe fevers, a vomit was adminiſtered whenever the patient complained of a ſickneſs and reaching to vomit, or was ſeized with a ſpontaneous vomiting; and the bark was never given till this ſickneſs was removed, or a purgative taken to clear more perfectly the whole alimentary canal. In thoſe patients who were troubled with a cough, attended with a pain in the ſide affecting the breathing, when the pain was not relieved by warm fomentations, the balſamum anodynum, or by a bliſter, the doctor generally ordered a few ounces of blood to be taken away, and endeavoured to ſtop the fever as ſoon as poſſible by the adminiſtration of the bark; having found that every return of the fever increaſed all ſuch pains. When the head-ach was very violent, and haraſſed the patient during the intermiſſions, the ſucceſs of the bark was rendered more complete by the application of a bliſter to the back.—A giddineſs of the head, which is the ſymptom moſt commonly remaining after even a ſlight intermitting fever, was generally relieved by the ſal C. C. and the bark in wine. The former of theſe was adminiſtered in the following manner.

℞ Aq. Alex. Simp. ℥vii.
Sal. C. C. ʒſs.
Syr. è Cort. Aurant. ℥i. M. f. julep. Cap. cochlear ij. ſubinde.

If from the continuance of the fever the patient was diſtreſſed with flatulence, a diſtenſion of the abdomen, and a ſwelling of the legs, a ſpoonfull of tinctura ſacra, with the addition of 30 drops of the ſpirit lavend. compoſ. was ordered to be taken every night.—A continuance of the bark, a change of air, and the cold bath, were often found requiſite to prevent a relapſe.

Such is the method of cure recommended by this experienced author, who has alſo diſcovered the efficacy and ſucceſs of opium in intermitting fevers. He informs us, that he has preſcribed an opiate to upwards of 300 patients labouring under this diſeaſe; and he obſerved, that, if taken during the intermiſſion, it had not the leaſt effect either in preventing or mitigating the ſucceeding paroxyſm: when given in the cold fit it once or twice ſeemed to remove it; but when given half an hour after the commencement of the hot fit, it generally gave immediate relief.—When given in the hot fit, the effects of opium are as follow. 1. It ſhortens and abates the fit; and this with more certainty than an ounce of the bark is found to remove the diſeaſe. It generally gives a ſenſible relief to the head, takes off the burning heat of the fever, and occaſions a profuſe ſweat. This ſweat is attended with an agreeable ſoftneſs of the ſkin, inſtead of the burning ſenſation which affect patients ſweating in the hot fit, and is always much more copious than in thoſe who have not taken opium. 3. It often produces a ſoft and refreſhing ſleep to a patient tortured in the agonies of the fever from which he awakes bathed in ſweat, and in a great meaſure free from all complaints.

The Doctor has always obſerved, that the effects of opium are more uniform and conſtant in intermitting fevers than in any other diſeaſe, and are then more quick and ſenſible than thoſe of any other medicine. An opiate thus given ſoon after the commencement of the hot fit, by abating the violence and leſſening the duration of the fever, preſerves the conſtitution ſo entirely uninjured, that, ſince he uſed opium in agues, a dropſy or jaundice has ſeldom attacked any of his patients in thoſe diſeaſes. When opium did not immediately abate the ſymptoms of the fever, it never increaſed their violence. On the contrary, moſt patents reaped ſome benefit from an opiate given in the hot fit, and many of them bore a larger doſe at that time than they could do at any other. The Doctor aſſures us, that even a delirium in the hot fit is not increaſed by opium, though opium will not remove it. Hence he thinks it probable, that many ſymptoms attending theſe fevers are ſpaſmodic; but more eſpecially the head-ach. However, if the patient be delirious in the fit, the adminiſtration of the opiate ought to be delayed until he recovers his ſenſes, when it will be found greatly to relieve the weakneſs and faintneſs which commonly ſucceed the delirium. Dr Lind is of opinion, that opium in this diſeaſe is the beſt preparative for the bark; as it not only produces a complete intermiſſion, in which caſe alone that remedy can be ſafely adminiſtered; but occaſions ſuch a ſalutary and copious evacuation by ſweat, as generally to render a much leſs quantity of bark requiſite. He commonly preſcribes the opiate in about two ounces of tinctura ſacra, when the patient is coſtive, who is to take the bark immediately after the fit. By theſe means the paroxyſm is ſhortened, and the inteſtines are cleanſed, previous to the adminiſtration of the bark; as the opiate doth not prevent, but only ſomewhat retards, the operation of the purgative. When a vomit is given immediately before the paroxyſm, the adminiſtration of the opiate ſhould be poſtponed till the hot fit is begun.

In the adminiſtration of the Peruvian bark, care ſhould be taken that it be of a good quality. And different opinions have been entertained with reſpect to the choice, even where there is no reaſon to believe that it has been adulterated by the mixture of other articles. For a long time, the preference was given to ſmall quilled pieces of a pale coloured bark; but of late the red bark, which is generally in larger maſſes, of an apparently coarſer texture, and evidently of a more reſinous nature, has been highly celebrated by Dr Saunders and others. And in caſes where it does not diſagree with the ſtomach or excite looſeneſs, it is admitted by the moſt accurate obſervers to be more powerful in preventing the return of intermittents. Whether the red bark be the product of a different ſpecies of the cinchona, or be obtained as well as the pale quilled bark from the cinchona officinalis, is not yet aſcertained with ſufficient accuracy.

A ſpecies of cinchona, diſtinguiſhed by the title of *cinchona Jamaicenſis*, has been diſcovered in Jamaica and other iſlands in the Weſt Indies. A very accurate deſcription of it has been given by Dr Wright of Jamaica in the Philoſophical Tranſactions of London. The bark of this ſpecies alſo has been recommended in the cure of intermittents; but the advantages of it have not hitherto been ſufficiently confirmed by experience. See CINCHONA and JESUITS *Bark*.

The barks of various trees readily cultivated in Britain, particularly different ſpecies of the ſalix, the prunus, the fraxinus, and the quercus, have by ſome been repreſented as no leſs efficacious than the Peruvian bark. But we may ſafely venture to aſſert, that although ſeveral of them may poſſeſs ſome power in ſtopping intermittents, yet that none hitherto tried can be conſidered as in any degree approaching to the cinchona in point of efficacy.

But although the Peruvian bark be the beſt cure for intermittents hitherto diſcovered, yet while it can by no means be repreſented as the only cure, it is very certain that other remedies have in different caſes ſucceeded after the cinchona has failed. Cures have often been obtained by the uſe of different aromatics, bitters, and aſtringents. Many articles from the mineral kingdom alſo have been employed with advantage. And intermittents have unqueſtionably been in certain caſes ſtopped by different preparations of iron, zinc, copper, lead, and mercury. But of all the articles of this nature, arſenic has of late been the moſt celebrated. Arſenic is on good grounds conjectured to be the baſis of an article much employed in the cure of intermittents in ſome of the countries where they are moſt prevalent, and ſold under the title of the *taſteleſs ague drop*. The great ſucceſs attending the uſe of this article, led Dr Fowler, an ingenious phyſician of Stafford, to examine it with particular attention. And in a treatiſe which he has lately publiſhed, entitled *Medical Reports* on the effects of arſenic in the cure of agues, he has given a formula for an arſenical ſolution, which he has found very ſucceſsful in affections of this kind, and which is probably very nearly the ſame with the taſteleſs ague drop. Dr Fowler's mineral ſolution, as he ſtyles it, is found by diſſolving 64 grains of arſenic and as much fixed vegetable alkaline ſalt in a pound of diſtilled water. This ſolution is given in doſes from three to 12 drops, varied according to the condition of the patient, and repeated two or three times a-day. And where the Peruvian bark has failed in ſtopping intermittents, it ſeems to be one of the moſt powerful remedies yet diſcovered. But after all remedies prove ineffectual, intermittents are often ſtopped by change of ſeaſon and of ſituation.

But beſides the remedies employed in tertian fevers and other intermittents, with the view of preventing the return of paroxyſms, it is often alſo neceſſary to employ powerful articles with other intentions, particularly to mitigate and ſhorten the paroxyſm when preſent; to obviate urgent ſymptoms, eſpecially thoſe of an inflammatory or putrid nature; and to obtain a complete apyrexia or intermiſſion from fever after the paroxyſm has ceaſed. With theſe intentions, recourſe is not unfrequently had to emetics, laxatives, bloodletting, bliſters, opium, diluents, or ſudorifics, as the circumſtances of the caſe may require.

The *Irregular* or *Spurious* TERTIAN. 127

Sp. I. var. 1. B.

Tertiana notha ſive ſpuria, *Sauv.* ſp. 2. *Sennert. Cleghorn. Hoffman.*

The characteriſtic marks of this fever are, that its paroxyſms laſt longer than 12 hours, and conſequently it inclines more to the quotidian or continued fever than the former. Its paroxyſms have no ſtated hour of attacking. The cure, however is preciſely the ſame with that above deſcribed, obſerving the proper cautions already mentioned with regard to the uſe of the bark.

The *Double* TERTIAN. Sp. I. var. 2. C. 128

Tertiana duplex, *Sauv.* ſp. 13. *Vog.* G. 12. *Sennert. Cleghorn.*

Duplicata, *Lin.* 18.

The double tertian comes on every day; but differs from the quotidian in ſo far, that its paroxyſms do not anſwer to each other ſingly, but alternately. The firſt day, for inſtance, the fit will come on in the forenoon, the ſecond in the afternoon, the third in the forenoon, and the fourth in the afternoon.

Of theſe fevers we ſhall give the following deſcription from Cleghorn's treatiſe on the diſeaſes of Minorca: "They are called *double tertians* when there are two fits and two intervals within the time of each period. But commonly there is ſome difference between the two fits, either in reſpect of the hour they come at, the time of their duration, or the nature and violence of their concomitant ſymptoms. Some double tertians begin in this manner.—On the evening of Monday, for example, a ſlight fit comes on, and goes off early next morning; but on Tueſday, towards the middle of the day, a more ſevere paroxyſm begins, and continues till night. Then there is an interval to Wedneſday evening, when a ſlight fit commences a new period of the fever, which proceeds in the ſame manner as the firſt; ſo that (according to the way phyſicians calculate the days of diſeaſes, by beginning to reckon from the firſt hour of their invaſion), both paroxyſms happen on the odd days, while the greateſt part of the even days is calm and undiſturbed. But in moſt double tertians the patient has a fit every day of the diſeaſe; the ſevere one commonly appearing at noon upon the odd days, the ſlight one towards evening on the even days; though ſometimes the worſt of the two fits happen on the even days.

"There is a tertian fever ſometimes to be met with, during each period of which there are three different fits, and as many intervals. For example, towards Monday noon the patient is ſeized with a paroxyſm, which declines about five or ſix o'clock the ſame evening: a few hours after, another fit begins, and continues until morning: from which time there is an interval to Tueſday evening, when a third fit comes on, and laſts moſt part of the night. On Wedneſday there are again two paroxyſms, as on Monday and on Thurſday, like that of Tueſday; and thus the fever goes on with a double fit on each of the odd days, and a ſingle fit on the even days.

"In double tertians, that interval is the moſt conſiderable which follows the ſevere fit; for the ſlight fit oftener ends in a remiſſion than intermiſſion, and frequently lingers till the other approaches: Hence it is, that the night preceding the vehement fit is much more reſtleſs than that which comes after it, as has been obſerved by Hippocrates. In double tertians, the vehement fit often comes on a little earlier in each period, while the ſlight fit returns at the ſame hour, or perhaps later and later every other day: ſo that the motions of one have no influence on thoſe of the other; from whence it appears, that each of theſe fits hath its own proper independent cauſes."

129 *Duplicated* TERTIAN. Sp. I. var. 2. D.

Tertian duplicata, *Sauv.* ſp. 14. *Jones. River.*

This hath two fits on the ſame day, with an intermediate day on which there are none. This alſo does not differ in any remarkable particular from thoſe already deſcribed.

130 The *Triple* TERTIAN. Sp. I. var. 2. E

Tertia triplex, *Sauv.* ſp. 15. *Cleghorn.*
Semitertiana, *Hoffman.*
Semitertiana ſecundi ordinis, *Spig.*

This differs from the former in having a ſingle and double fit alternately: thus, for inſtance, if there are two fits the firſt day, there is only one the ſecond, two the third, one the fourth, &c. Its cure the ſame as before.

131 The *Semi*-TERTIAN. Sp. I. var. 2. F.

Hemitritæus, *Celſ.*
Semitertiana, *Cleghorn.*
Semitertiana ſecundi ordinis, *Spig.*
Amphimerina hemitritæus, *Sauv.* ſp. 8.
Amphimerina pſeudo hemitritæus, *Sauv.* ſp. 9.

The ſemitertian is deſcribed by Dr Cullen as having only an evident *remiſſion* between its paroxyſms; more remarkable between the odd and even days, but leſs ſo between the even and odd one. For this reaſon, he adds, that poſſibly ſome ſemitertians ought rather to be claſſed among the remittents; and owns that it is difficult to ſettle the boundaries between them. But Cleghorn, whom he quotes, deſcribes it in the following manner. "A fit begins on Monday noon, for example, and goes off the ſame night. On Tueſday afternoon a ſecond fit comes on, and gradually increaſes till Wedneſday night, when it terminates. On Thurſday morning there is ſuch another interval as happened on Tueſday morning: But on Thurſday afternoon another long fit like the preceding commences; and returning regularly every other day, leaves only a ſhort interval of ten or twelve hours during the eight and forty.

Concerning the cure of theſe fevers Dr Cullen obſerves, that though no entire apyrexia occurs, the bark may be given during the remiſſions; and it ſhould be given even though the remiſſions be inconſiderable; if, from the known nature of the epidemic, intermiſſions or conſiderable remiſſions are not to be expected, and that great danger is apprehended from repeated exacerbations.

132 The *Sleepy* TERTIAN. Sp. I. var. 3. G.

Tertiana carotica, *Sauv.* ſp. 10. *Werlhoſ.*
Tertiana hemiplegica, *Sauv.* ſp. 20. *Werlholſ.*
Quotidiana ſoporoſa, *Sauv.* ſp. 8 *Car. Piſ.*
Febres caput impetentes, *Sydenham*, ep. ad R. Brady.

This, according to Vogel, is a moſt dangerous ſpecies, and very commonly fatal; for which reaſon he ranks it among thoſe intermittents which he calls *malignant*. Sometimes he tells us the alarming ſymptom of a ſleepineſs comes on, not at the beginning of the diſeaſe, but will unexpectedly occur during the third fourth, fifth, or ſixth paroxyſm. It commonly begins with the cold fit, and continues during the whole time of the paroxyſm, and, becoming ſtronger at every ſucceeding one, at laſt terminates in a mortal apoplexy. Sometimes fevers of this kind rage epidemically. Vogel relates, that he ſaw a ſimple tertian change into one of theſe dangerous fevers. The patient was a woman of a delicate conſtitution, and the ſymptom appeared in conſequence of her being put in a violent paſſion: however, it occurred but once, and ſhe recovered. Hoffman mentions a carus in a double tertian occurring ſeven times without proving mortal; though Vogel ſays, that the powers of nature are very ſeldom ſufficient to conquer the diſeaſe.

In 1678, Dr Sydenham tells us that intermittents raged epidemically at London, where none had appeared before from 1664. Of them "it is to be noted (ſays he), that though quartans were moſt frequent formerly, yet now tertians or quotidians were moſt common, unleſs the latter be intitled double tertians; and likewiſe, that though theſe tertians ſometimes began with chilneſs and ſhivering, which were ſucceeded firſt by heat, and ſoon after by ſweat, and ended at length in a perfect intermiſſion, returning again after a fixed time, yet they did not keep this order after the third or fourth fit, eſpecially if the patient was confined to his bed and uſed hot cardiacs, which increaſe the diſeaſe. But afterwards this fever became ſo unuſually violent, that only a remiſſion happened in the place of an intermiſſion; and approaching every day nearer the ſpecies of continued fevers, it ſeized the head, and proved fatal to abundance of perſons."

From this deſcription of Sydenham's we may have an idea of the nature of the diſeaſe. As to its cure, he ſtrongly recommends the bark; telling us, that, even in the *moſt continued* kind of intermittents, "the nearer the intermittent approaches to a continued fever, either ſpontaneouſly, or from uſing too hot a regimen, ſo much the more neceſſary is it to exhibit a larger quantity of the bark; and that he took advantage of a remiſſion, though ever ſo ſmall.

133 The *Spaſmodic* or *Convulſive* TERTIANA. Sp. I. var. 3. H.

Tertiana aſthmatica, *Sauv.* ſp. 6. *Bonet.*
Tertiana hyſterica, *Sauv.* ſp. 8. *Wedel.* A. N. C. Dec. I. A. II. obſ. 193.
Hyſteria febricoſa, *Sauv.* G. 135. ſp. 8. A. N. C. Dec. I. Ann II.
Tertiana epileptica, *Sauv.* ſp, 16. *Calder. Lau ter.*
Quotidiana epileptica, *Sauv.* ſp. 3. Edinb. Eſſays, Vol. 5. art. 49.
Ecclampſia febricoſa, *Sauv.* G. 133. ſp. 17.
Epilepſia febricoſa, *Sauv.* G, 134. ſp. 9.
Tertiana tetanodes *Medici* Beobacht I. Band.
Tetanus febricoſus, *Sauv.* G. 122. ſp. 10. *Stork,* Ann. Med. II.

Tertians of this kind occur with very different ſymptoms from thoſe of the true ones, and ſometimes even with thoſe which are very extraordinary. In ſome they are attended with ſymptoms of aſthma, in others with thoſe of hyſterics, in others with convulſions. Where the ſymptoms of aſthma occur, the diſeaſe muſt be treated with diuretics and antiſpaſmodics joined with the bark. In the hyſteric aſthma the fit comes on with cold, yawning, cardialgia, terror and dejection of mind. The diſeaſe is to be removed by mild aperients and antihyſterics joined with the bark.

Of the convulſive tertian we have a moſt remarkable inſtance in the Edinburgh Medical Eſſays, Vol. V. The patient was a farmer's ſon about 26 years of age, of a ſtrong plethoric habit of body. He had laboured under an ague half a-year, and had taken a great deal of bark. While he was telling his caſe to the ſurgeon (Mr Baine of Pembroke), he was ſuddenly taken with a violent ſtamping of his feet; and the convulſions gradually aſcended from the ſoles of the feet to his legs, thighs, belly, back, and ſhoulders. His head was then moſt violently convulſed, with a total deprivation of ſpeech; but he had a moſt diſmal vociferation, that might have been heard at a conſiderable diſtance, his abdomem and thorax working and heaving violently and unuſually in the mean time. This fit having laſted half an hour, a profuſe ſweat broke out over all his body, which relieved him; and he then became capable of anſwering ſuch queſtions as were put. Theſe extraordinary fits, he ſaid, had been occaſioned by a fright, and his neighbours had concluded that he was bewitched. They returned ſometimes twice a-day, and always at the times the ague uſed to return. During the paroxiſm his pulſe was very high and quick, his face much inflamed, and his eyes ready to ſtart out of his head. After the fit was over, he complained of a moſt torturing pain of the bowels. His tongue was generally moiſt, and he had a ſuppreſſion of urine.—This formidable diſeaſe, however, was totally ſubdued by the uſe of the bark, mercurials, antiſpaſmodics opiates, and ſaline draughts.

The *Eruptive* TERTIAN. Sp. I. var. 3. I.

Tertiana petechialis, *Sauv.* ſp. 3. *Donat. Lautter.*
134 Tertiana ſcorbutica, *Wedel.* A. N. C. Dec. I. A. II. obſ. 193.
Tertiana urtica, *Sauv.* ſp. 22. *Planchon.* Jour. de Med. 1765. *Cleghorn.*
Tertiana miliaris, *Sauv.* ſp. 21. Walthier.

This ſpecies of tertian is accompanied with red or livid blotches on the ſkin, or an eruption like that occaſioned by the ſtinging of nettles. In the latter caſe Dr Cleghorn ſays the diſeaſe is very dangerous; and as the former indicates an incipient diſſolution and putrefaction of the blood, it muſt alſo be reckoned of very dangerous tendency.

The *Inflammatory* TERTIAN. Sp. I. var. 3. K. 135

Tertiana pleuritica, *Sauv.* ſp. 4. *Valeſ. Lautt.*
Pleuritis periodica, *Sauv.* G. 103. ſp. 14.
Tertiana arthritica, *Sauv.* ſp. 5. *Morton. Lautt.*

Sauvages informs us, that he has ſeen a true and genuine pleuriſy having all the pathognomic ſigns of the diſeaſe, but aſſuming the form of an intermittent; that is, the patient is one day affected with the pleuriſy, and the next ſeemingly in perfect health. He alſo tells us, that in the month of May 1760 a tertian raged epidemically, which after the third fit imitated a pleuriſy, the pain of the ſide and difficulty of breathing coming regularly on, and the fever from an intermittent becoming remittent; the blood had alſo the ſame appearance with that of pleuritic perſons, and the diſtemper yielded to bleeding and gentle cathartics.—Morton alſo informs us, that he has obſerved ſimilar diſorders an hundred times over, which were always certainly and ſafely cured by the Peruvian bark.

The TERTIAN *complicated* with other *Diſorders,* Sp. I. var. 4.

Tertiana ſcorbutica, *Sauv.* ſp. 9. *Etmuller. Timæus.*
Tertiana ſyphilitica, *Sauv.* ſp. 17. *Deidier.*
Tertiana verminoſa, *Sauv.* ſp. 18. *Stiſſer.* in act. Helmſtad. *Lanſciſ.* de noxis pallud. *Pringle. Rammazzini. Van den Boſch.* de conſt. vermin.

The ſcorbutic tertian, according to Sauvages, is exceedingly anomalous, its periods being ſometimes much anticipated, and ſometimes much poſtponed. It is exceedingly obſtinate, and will return if the body be not cleared of its ſcorbutic taint. The patient is affected with lancinating pains of a wandering nature. The urine lets fall a duſky red ſediment, or a thick branny matter is copiouſly ſcattered up and down in it, ſeemingly tinged with blood. The uſual ſymptoms of ſcurvy, viz. livid ſpots, and rotten fetid gums, alſo frequently occur. For this the Peruvian bark, is very uſeful, both as a febrifuge and antiſcorbutic.

A tertian accompanied with worms is taken notice of by Sir John Pringle in his treatiſe on the diſeaſes of the army. The worms, he tells us, were of the round kind; and though we are by no means to reckon them the cauſe of the fever, they never failed to make it worſe, occaſioning obſtinate gripings or ſickneſs at ſtomach. In theſe caſes ſtitches were frequent; but, being flatulent, were not often relieved by bleeding. The worms were diſcharged by vomiting as well as by ſtool. For diſcharging theſe worms, he commonly gave half a drachm of rhubarb with 12 grains of calomel; without obſerving any inconvenience from ſuch a large doſe of mercury. Anthelmintics, which act ſlowly, had little chance of doing good; for though worms will ſometimes lie long in the bowels without giving much uneaſineſs to a perſon otherwiſe well, yet in fever, eſpecially one of a putrid kind (to which his intermittents always ſeemed to incline), the worms being diſturbed by the increaſe of heat, and the corruption of the humours in the *primæ viæ*, begin to move about, and ſtruggle to get out. Lanciſius, who makes this remark, adds, that upon opening the bodies of ſome who had died at Rome of fevers of this kind, wounds were found in the inteſtines made by the biting of the worms; nay, that ſome of them had even pierced through the coats of the guts, and lay in the cavity of the abdomen. Pringle never had any inſtance of this; but knew many caſes in which the worms eſcaped by the patient's mouth, though there had been no previous retching to bring them up. One ſoldier was thrown into violent convulſions, but was cured by the above-mentioned powder.

137 The Tertian *varied* from its *Origin*. Sp. I. var. 5.

Tertiana accidentalis, *Sauv.* Sp. 12. *Sydenham.*.
Tertiana a ſcabie, *Sauv.* ſp. 12. *Juncker*, tab. 80. *Hoffman*, II. p. 12.

The exiſtence of fevers of this kind, as we have already obſerved, is denied by Dr Cullen; the accidental fever of Sauvages was ſaid to ariſe from any ſlight error in the non-naturals, and conſequently was very eaſily cured. That which aroſe from the repulſion of the itch, was cured as ſoon as the eruption returned.

138 The Tertian with only *remiſſion* between the fits. Sp. II.

Remittent Tertian.

Tritæophya, *Sauv.* Gen. 85. *Sag.* p. 695.
Tritæus, *Lin.* 21.
Hemitritæa, *Lin.* 23.
Tertianæ remittentes et continuæ Auctorum.
Tertianæ ſubintrantes, proportionatæ, ſubcontinuæ, *Torti.*
Tertiana ſubcontinua, *Sauv.* ſp. 19.
Quotidiana deceptiva, *Sauv.* ſp. 2.
Amphimerina ſemiquintana, *Sauv.* ſp. 24.
Tritæophya deceptiva, *Sauv.* ſp. 10.
Cauſos *Hippocratis.*
Tritæophya cauſus, *Sauv.* ſp. 2.
Febres ardens *Boerhaavii*, aph. 738.
Tertiana perniciosa, quæ ſimulata tertiani circuitus effigie lethalis, et mille accidentibus periculoſiſſimis implicata, exiitit. *Lud. Mercatus.*
Tertiana peſtilens, *P. Sal. Diverſus.*
Tertiana maligna peſtilens, *Riverii.*
Morbus. Hungaricus. *Lang.* *Lemb.* *Sennert.* *Jordan.*
Languor Pannonicus, *Cober.*
Amphimerina Hungarica, *Sauv.* ſp. 10.
Hemitritæus peſtilens, *Schenck.* ex *Corn. Gamma.*
Febres peſtilentes Ægyptiorum, *Alpin.*
Febres tertiana epidemia, *Bartholin.*
Febres epidemicæ, autumni 1657 et 1658, *Willis.*
Febres ſyneches epidemica, ab anno 1658 ad 1664. et poſtea ab anno 1673 ad 1601, *Morton.*
Febres autumnales incipientes, *Sydenham.*
Affectus epidemicus Leidenſis, *Fr. Sylvii.*
Morbus epidemicus Leidenſis, 1669, *Fanois.*
Tertianæ peniciosæ et peſtilentes, et febres caſtrenſes epidemiæ, *Lanciſi.*
Febres intermittentes anomalæ et mali moris, *Hoffman.*
Febres cholerica minus acuta, *Hoffman.*
Febres epidemica Leidenſes, anno 1719, *Koker* apud *Holler*, Diſp. tom. V.
Amphimerina paludoſa, *Sauv.* ſp. 19.
Febres paludum, *Pringle.*
Bononienſis conſtitutio hiemalis 1729, *Beccari* in A. N. C. Vol. III.
Amphimerina biliöſa, *Sauv.* ſp. 22.
Febris caſtrenſis, *Pringle.*
Febris putrida epidemica, *Huxham de aëre ad ann.* 1729.
Febris bilioſa Lauſanenſis, *Tiſſot.*
Tritæophya Wratiſlavienſis, *Sauv.* ſp. 3. Hahn. Epidemia verna Wratiſlav. in App. ad. A. N. C. Vol. X.
Tritæophya Americana, *Sauv.* ſp. 12.
Febris anomala Batava, *Grainger.*
Morbus Naronianus, *Pujati.*
Febris continua remittens, *Hillary's* diſeaſes of Barbadoes.
Febris remittens Indiæ orientalis, *Lind.* diſſ. inaug. 1768.
Febris critica et febr. Bilioſa æſtatis, *Rouppe.*
Febris remittens regionum calidarum, *Lind* on the diſeaſes of hot climates.
A. Tertiana cholerica ſive dyſenterica, *Tort.* Therap. Special. lib. iii. cap. 1. *Leutter.* Hiſt. Med. caſ. 6. 16. 17. 20. *Morton*, App. ad Exerc. II.
B. Tertiana ſubcruenta ſive atrabilaris, *Tort.* ibid. Never ſeen by *Cleghorn.*
C. Tertiana cardiaca, *Tort.* ibid. *Lautter*, Hiſt. Med. caſ. 15. 15. 23.
Amphimerina cardiaca, *Sauv.* ſp. 5.
Tritæophya aſſodes, *Sauv.* ſp. 6.
Febris continua aſſodes, *Vog.* 27.
D. Tertiana diaphoretica, *Tort.* ibid.
Tritæophya typhodes, *Sauv.* ſp. 4.
Tritæophya elodes, *Sauv.* ſp. 5.
Febris continua elodes, *Vog.* 21.
E. Tertiana ſyncopalis. *Tort.* ibid. *Lautter.* caſ. 11. 12. 13. 15. 16.
Tritæophya ſyncopalis, *Sauv.* ſp. 1.
Amphimerina ſyncopalis, *Sauv.* ſp. 4.
Amphimerina humoroſa, *Sauv.* ſp. 6.
Amphimerina ſyncopalis, *Vog.* 29.
F. Tertiana algida, *Tort.* ibid. *Lautter*, caſ. 13.
Amphimerina epiala, *Sauv.* ſp. 3.
Amphimerina phricodes, *Sauv.* ſp. 7.
Triteophya leipyria, *Sauv.* ſp. 9.
Tertiana leipyria, *Sauv.* ſp. 23. *Valcarengli* Med. Ration. p. 18.
Febris continua epiala et leiparia, *Vog.* 19. et 24.
G. Tertiana lethargica, *Tort.* ib.
Tritæophya carotica, *Sauv.* ſp. 7. *Lautter*, 1. 7. 14.

Febres.

Tertiana apoplectica, *Morton.* Exerc. I. cap. ix. hiſt. 25.

Tertiana ſoporoſa, *Werlhof.* de febr. p. 6.

Febris epidemica Urbevetana, *Lancif.* de noxis pal. effluv. I. II. c. 3.

The remittent fevers are much more dangerous than the true intermittents, as being generally attended with much greater debility of the nervous ſyſtem and tendency to putreſcency in the fluids than the latter. Sauvages divides his tritæophya, a remittent tertian, into the following ſpecies.

139 1. *Tritæophya ſyncopalis*, or that attended with fainting. It begins like a tertian, with cold ſucceeded by heat and profuſe ſweating; but attended with much more dangerous ſymptoms, ſuch as cardialgia, enormous vomiting, great weakneſs, ſmall contracted pulſe, coldneſs of the extremities, and, unleſs timely aſſiſtance be given, kills during the ſecond or third paroxiſm.

140 2. The *cauſus*, or burning fever of Hippocrates, returns every third day without any new ſenſation of cold; and is attended with great thirſt, heat, but without diarrhœa or ſweat, and continues only for one week or two at the utmoſt. It attacks chiefly young people of a robuſt and bilious habit of body, who have been accuſtomed to much exerciſe, and expoſed to the ſun during the heats of ſummer, and have alſo uſed a phlogiſtic regimen. The tongue is dry, ſometimes black; the urine of a red or flame colour; together with pain of the head, anxiety, and ſometimes other ſymptoms ſtill more dangerous.

141 3. *Tritæophya Vratiſlavienſis*, was a peſtilential diſeaſe occaſioned by famine, during which the people fed on putrid aliments: the air was infected by the vaſt numbers of bodies of thoſe ſlain in battle, and the inhabitants were alſo dejected by reaſon of being deprived of their harveſt and other calamities; to all which was added the continuance of a calm in the atmoſphere for a long time. It began with an acute fever, leipyria or coldneſs of the external parts and ſenſation of burning heat inwardly; general weakneſs; pain of the head and præcordia: ſerous or bilious diarrhœa; a delirium, in ſome furious, and accompanied with a dread of being expoſed to the air; on the ſecond day the thirſt was violent, attended with a bilious vomiting as well as diarrhœa, tough viſcid ſpitting, fainting, burning heat in the bowels, the tongue dry and ſeeming as if burnt with a hot iron, a ſuppreſſion of the voice, anxiety, ſtupor; after which quickly followed convulſions and death. In ſome fevers a leipyria came on with an exceeding great cold of the extremities, preſently followed by an intolerable heat of the viſcera, with ſymptomatic ſweats, violent diarrhœa, followed by a very itchy miliary eruption. On the fourth day came on copious ſweats, ſpaſms of the lower jaw, nauſea, involuntary paſſing of urine, ſlight delirium, a flux of ichorous matter from the noſtrils, and exceeding tough ſpitting, an epilepſy, and death. Profeſſor Hahn, who gives the Hiſtory of this diſeaſe, was himſelf attacked by it, and ſuffered in the following manner. On the firſt day was a violent feveriſh paroxiſm without rigor, a ſharp pain in the occiput, and immediately an inflammatory pain over the whole head; the feet were extremely cold, and the extremities rigid with ſpaſms. The pain continued to increaſe daily to ſuch a degree, that the contact of the air itſelf became at laſt intolerable; a dejection of mind and incredible weakneſs followed; he paſſed reſtleſs nights with continual ſweating, heavy and pained eyes, and an unuſual ſenſation of rheumatiſm over the whole body. On the third day the pains were aſſuaged, but he had a very bad night. On the fourth day all the ſymptoms were worſe, the feet quite chilled, the hands very red and agitated with convulſive motions; he was terrified with apprehenſions of death, and had a vomiting every now and then: this day ſponges dipped in cold water were applied over the whole body, and he uſed cold water for his drink. On the eighth day the pulſe was convulſive; and the pains were ſo violent, that they made him cry out almoſt continually. On the ninth day he was delirious, and threw up ſome grumous blood. On the 11th his pulſe was more quiet, and he had a ſweat; a decoction of the bark was given; his voice was broken, his ſpeech interrupted, and his teeth chattered upon one another. On the 12th his jaw was convulſed, he had a riſis ſardonicus, and deafneſs; after which, the paroxyſms returned leſs frequently, and only towards night. On the 14th he had a chilling cold over the whole body, a cold ſweat; frequent lotions were applied, and all the ſymptoms became milder. On the 18th he had a quick delirium, but fainted as ſoon as taken out of bed; a ſenſation of hunger, followed by copious ſweats; profound ſleep; an averſion from noiſe; every thing appeared new and extraordinary. On the 36th a cholera; on the 48th a ſcaling off of the ſkin, and falling off of the nails. This epidemic carried off above 3000 people at Warſaw. Frequent lotion of the body either cold or tepid, watery glyſters, and the copious introduction of watery fluids under the form of drink, were of ſervice. But the moſt favourable criſis was under the form of ſome cutaneous eruption.

Tertians.

142 4. *Tritæophya typhodes.* The principal ſymptom of this fever was a continual ſweat with which the patients were almoſt always wet; with paroxiſms returning every third day. Sauvages tells us, that he had twice an opportunity of obſerving this fever; one was in the teacher of an academy, about 40 years of age, and of a melancholic temperament. He ſweated every other night ſo plentifully, that he was obliged to change his linen nine times; and even on the intermediate days was never perfectly free of fever, and had his ſkin moiſtened with ſweat. The other was of a woman who went about in man's cloathes, and was diſcovered only after her death. The diſeaſe began with a ſlight ſenſation of cold, after which ſhe ſweated for eight hours. It was attended with the higheſt debility, anxiety, and at the ſame time an inſatiable hunger.

143 5. *Tritæophya elodes*, was an inflammatory epidemic, but not contagious, terminating about the 14th or 21ſt day. The diſeaſe came on in the night-time, with diſturbed reſt, univerſal weakneſs, watchings, great heat and ſweat, redneſs of the face and almoſt of the whole body, ſparkling eyes, the tongue dry and white; a hard, tenſe, and turgid pulſe: about the third day a kind of frenzy frequently came on with the feveriſh paroxyſm, the forerunner of an univerſal miliary eruption; or, what was worſe, with purple ſpots ſo cloſe together, that they looked like an eryſipelas

of the whole body. Sometimes bliſters of the ſize of ſmall pearls, filled with acrid ſerum, appeared on the neck, armpits, and trunk of the body, which were of all others the moſt dangerous. There was a variety of the diſeaſe, which our author calls the *humoralis*, and in which the pulſe was ſoft and feeble, with greater weakneſs over the whole body, and the diſpoſition to ſleep more frequent than in the other; the eyes languid; the tongue very white, but not dry; and worms were diſcharged.

144 6. *Tritæophya aſſodes.* This ſpecies aroſe from a foulneſs of the primæ viæ, and the effluvia of waters in which hemp had been ſteeped. It began with rigor, followed by great heats, reſtleſſneſs, toſſing of the limbs, terrible faintings, immoderate thirſt, dryneſs of tongue, delirium, and at length exceſſive watchings; theſe laſt, however, were leſs dangerous than vertigoes or comatoſe diſpoſitions, which brought on convulſions or apoplexies.

145 7. *Tritæophya carotica.* This had exacerbations every other evening; and its diſtinguiſhing ſymptom was an exceſſive inclination to ſleep, preceded by a ſevere headach, and followed by delirium, and ſometimes convulſions; the tongue was black, and the patient inſenſible of thirſt after the delirium came on. In thoſe caſes where the diſeaſe proved fatal, a ſubſultus tendinum and other grievous ſymptoms came on.

146 9. *Tritæophya leipyria* is only a variety of the tritæophya cauſus, already deſcribed.

147 10. *Tritæophya deceptiva.* This ſpecies at firſt aſſumes the appearance of a continued fever; but afterwards degenerates into a remittent, or even an intermittent. It is deſcribed by Sydenham, but attended with no remarkable ſymptoms.

148 11. The laſt of Sauvages's ſpecies of Tritæophya belonging to the remitting tertian is the *Americana*. This, according to Sauvages, is the ardent fever with which the Europeans are uſually ſeized on their firſt coming to America, and generally carries off one half of them. Of this there are two varieties, the *very acute* and the *acute*. The very acute ends before the ſeventh day. It comes on a few days after the perſon's arrival, with loſs of appetite, with dyſpnœa and ſighing from weakneſs, head-ach, laſſitude, pain of the loins: a pyrexia ſucceeds, with great thirſt, ſweat, and heat; the ſickneſs increaſes, nauſea comes on, with vomiting of porraceous bile; the tongue rough, the extremities often cold; watching, furious delirium; and the patient frequently dies on the third day. Copious ſweats, and a plentiful hemorrhagy from the noſe on the fifth day, but not ſooner, are ſerviceable; but a bilious diarrhœa is the beſt criſis of all.

The acute kind terminates moſt frequently on the ninth, but very rarely goes beyond the fifteenth day. Death frequently comes on between the fourth and ſeventh days. It begins with head-ach, pain in the loins, and ſometimes ſhivering; great laſſitude, dyſpnœa, thirſt; burning fever, increaſing every third day; inflation of the abdomen, pain at the pit of the ſtomach, nauſea, and bilious vomiting. Such is the ſtate of the diſeaſe within twenty-four hours. The eyes are red, and full of tears; the urine pellucid; there is a low delirium, and continual anxiety; the tongue is dry and red, and ſometimes, though rarely, black, which is a ſtill worſe ſign; the pulſe, formerly ſtrong and full, ſinks about the fourth day, and becomes tenſe and ſpaſmodic: if a carus then comes on, the patient dies the fifth or ſixth day; but if the pulſe keeps up, and no carus comes on, a criſis is to be expected by ſweat, by a copious hemorrhagy from the noſe, or, which is ſtill more ſafe, by a bilious diarrhœa, which is never ſalutary if it comes on before the fifth day.

To the Remitting tertian alſo belong the following ſpecies mentioned by Sauvages, viz.

149 1. *Tertiana ſubcontinua.* This begins like a genuine tertian, and at firſt hath diſtinct paroxyſms; but theſe grow gradually more and more obſcure, the diſeaſe acquiring daily more of the appearance of continued fever, by which it is to be diſtinguiſhed from the other varieties of this ſpecies. It is not unfrequently joined with thoſe ſymptoms which attend the fatal fever already mentioned; as cardialgia, cholera, ſyncope, &c. but in a much leſs degree. The diſeaſe commonly begins with little or no ſenſe of cold, but rather a ſenſation of heat; when the tertian is doubled, it has firſt a ſlighter and then a more ſevere fit; and thus goes on with an exacerbation on the even days: and though it ſhould change from a double into a ſingle tertian, we are ſtill to ſuſpect it, if a weak fit is the forerunner of a very ſtrong one. This change of the tertian into a continued fever is alſo to be prognoſticated if a heat remarkable to the touch is perceived on the day of intermiſſion, together with ſome diſturbance of the pulſe, thirſt, and dryneſs of the tongue; all of which ſhow an univerſal tendency to inflammation: the ſame is foretold by the urine being in ſmall quantity, and very red, or of a ſaffron colour; alſo an ulcerous or aphthous inflammation of the throat, with difficulty of ſwallowing, or any very ſevere ſymptom coming on in the beginning of the diſeaſe, excepting only a delirium, which is eaſily removed.

150 2. *Quotidiana deceptiva.* This is a diſorder of an inflammatory kind, with a ſtrong tendency to putreſcency, and ſometimes aſſumes the form of a quotidian. In it the patient frequently complains of cold when he really is hot, and the remiſſion is very indiſtinct; and the diſeaſe is known by the great languor of the patient and the foulneſs of his tongue.

151 3. *Amphimerina cardiaca* is an acute malignant fever, with daily exacerbations, attended with fainting and vomiting of green bile. Afterwards, the weakneſs increaſing, the patient's extremities grow cold, and a profuſe ſweat comes on, which is frequently ſucceeded by death on the fourth day. Another ſpecies reſembling this Sauvages calls the *ſyncopalis;* but the cardiaca differs from it in being attended with cardialgia.

152 3. *Amphimerina paludoſa.* This is the fever deſcribed by the Britiſh phyſicians under many different names, and appearing under various forms, according to the different conſtitutions of the patients. This fever in the Eaſt Indies, according to Dr Lind of Windſor, generally comes on ſuddenly, and begins with a ſenſe of debility and very great lowneſs of ſpirits. Theſe ſymptoms are attended with a greater or leſs degree of chillineſs, a dizzineſs, a nauſea, very acute pains in the head and loins, and a trembling of the hands; the countenance is pale, the ſkin commonly very dry and corrugated, the eyes dull and heavy, the pulſe quick and ſmall, the breath generally difficult, and interrupted with hiccough.

As the paroxyſm increaſes, the chillineſs now and then gives way to irregular heats, which ſoon become violent and permanent; the nauſea likewiſe increaſes; and in ſome there comes on a vomiting, in which they throw up a great deal of bile. Sometimes bile is likewiſe voided by ſtool. The ſkin grows red; the eyes ſmall, and ſometimes not a little inflamed. The pulſe becomes fuller, and the breathing more difficult, attended with great reſtleſſneſs and a troubleſome thirſt; notwithſtanding which (ſo great is the nauſea) the patient cannot endure any kind of liquids. The tongue becomes foul, and the pain of the head and loins more violent; a delirium then follows; a ſlight moiſture appears on the face, and from thence ſpreads to the other parts; whilſt the violence of the other ſymptoms abates, and ſhows the beginning of a remiſſion, which is completed by plentiful ſweats.

On the fever's remitting, the pulſe returns almoſt to its natural ſtate; the pains of the head and loins ſtill continue, though ſomewhat leſs violent, as likewiſe the nauſea and want of appetite. When the diſeaſe gains ſtrength, the remiſſion is ſcarcely obvious, and is immediately followed by another paroxyſm; which begins, not indeed with ſo great a ſhivering, but is attended with a greater pain of the head, the greateſt anxiety, a heartburn, nauſea, vomiting, and bilious ſtools. The matter moſt commonly evacuated by vomit and ſtool is whitiſh like chalk and water, or curdled milk which is vomited by ſucking children, when the curd is much broke down. A heat, immoderate thirſt, and delirium, now come on. The tongue becomes more foul; the teeth and inſide of the lips are covered with a black cruſt; the breath grows hot and fetid: another remiſſion enſues, attended with a ſweat; but this remiſſion is both ſhorter and leſs obvious than the firſt.

This ſecond remiſſion is ſucceeded by a paroxyſm, in which the ſymptoms are far more violent than in the former; that which the patient diſcharges by vomiting and purging is more fetid; the mouth, teeth, and inſide of the lips, are not only covered with a black cruſt, but the tongue becomes ſo dry and ſtiff, that the patient's voice can ſcarce be heard. Violent delirium, with reſtleſſneſs and anxiety, come on chiefly during the paroxyſm; nor do theſe ſymptoms abate till the fever remits, and the patient ſweats.

When the fever becomes ſo violent, during the third fit, as to end in death, which is generally the caſe, ſome of the ſick have a coma; in others the delirium becomes more violent. The diſcharges now become more fetid, and have a cadaverous ſmell; the ſtools are involuntary; the pulſe is ſo quick, ſmall, and irregular, that it is ſcarce to be counted, or even felt; a cold ſweat is diffuſed over the whole body, eſpecially the head and neck: the face becomes Hippocratic and convulſed; the patient picks the bed-clothes; a ſubſultus tendinum comes on; the ſick lie conſtantly on their backs, and inſenſibly ſlide down to the foot of the bed; their extremities grow cold; they are then ſeized with convulſions, with which the ſcene cloſes.

In this fever, the urine, which at the beginning is pale, becomes of a deeper colour by degrees, but without depoſiting any ſediment. There ſeldom or never appear any petechiæ, and the prickly heat which was before on the ſkin vaniſhes on the firſt appearance of the fever. But though theſe were the general ſymptoms of this diſorder, they varied in the different ſubjects, and at different ſeaſons of the ſame year. The pulſe, for example, in ſome, was quick in the beginning of the diſorder; in others, it varied with the other ſymptoms. The ſkin was generally dry in the beginning of the fit; but in ſome it was moiſt, and covered with ſweat from the very firſt beginning of the diſeaſe. In the month of September, when the diſorder raged moſt, the remiſſions were very imperfect and obſcure; but, on the return of winter and the healthy ſeaſon, they became more regular, and the diſeaſe aſſumed the appearance of an intermitting fever, to ſuch a degree as at length not to be diſtinguiſhed from it. In ſome the remiſſions could ſcarce be perceived, and the fever continued for two weeks without any material change for the better or the worſe. At this time numbers were ſeized with it. When the diſorder continued for any time without a change, it generally ended in death; while the weather grew better, it ſometimes, in the ſpace of a few days, from a common fever became an intermitting one, and the patient recovered, unleſs his liver, which was ſometimes the caſe, happened to be affected. The cure of an inflammation of the liver proved uncertain and tedious; as it was commonly followed by a colliquative diarrhœa, which generally endangered the patient's life.—Every ſucceeding paroxyſm was obſerved to be more dangerous than the preceding; the third generally proved fatal; ſome died during the firſt. When this happened, the fever, in the language of the country, was called *puca*, that is a ſtrong fever.

This diſeaſe, according to Dr Lind of Haſlar hoſpital, is the autumnal fever of all hot countries, the epidemic diſeaſe between the tropics, and the diſeaſe moſt fatal to Europeans in all hot and unhealthy climates. All authors agree that intermittents in general, but particularly this dangerous kind of them, are produced by heat and moiſture. Dr Lind of Windſor remarks, that the European ſeamen are very ſubject to the fever abovementioned when they happen to arrive at Bengal in autumn. They are prediſpoſed to it from the nature of their food, their confinement on board, the very great heats to which they are expoſed during the voyage, and their lying for hours together expoſed to the night colds.

Moſt of the meat uſed by the crews of thoſe ſhips is ſalted, and often in a putrid ſtate, without any freſh vegetables, they having only biſcuits, and ſome other farinaceous matters. The quantity of the vinous or ſpirituous liquors allowed them is by far too ſmall to ſubdue the putreſcent diſpoſition of their animal-food. Their fluids conſequently become, from day to day, more and more putreſcent, and of courſe the more apt to breed and contract this diſorder. This diſpoſition is likewiſe induced by their being ſtowed very cloſe together, and that for a conſiderable length of time, and in a foul air, eſpecially when the weather happens to be too ſtormy to permit the hatches and port-holes to be kept open.

Though the heats they endure in the voyage to India are leſs conſiderable than thoſe of the country itſelf, yet they are too much for an European conſtitution to be ar The general heat at ſea within the tropics is about 84° of Fahrenheit's thermometer, which is ſufficient to relax them, and promote a corruption of their humours, eſpecially when it coincides with the above cauſes. It likewiſe creates a languor and indolence, which alone are ſufficient to increaſe that putreſcence. Theſe cauſes are apt to be conſiderably aggravated by the mens being often expoſed, when on duty, for hours together, to rain, damp, and cold air; a circumſtance which frequently happens to them when working their ſhips up the river Ganges in the night-time. Hence the perſpiration is checked, and the excrementitious fluid which uſed to be diſcharged by the ſkin being retained in the body, contributes, he thinks, very much towards the prediſpoſition to this diſeaſe.

But the moſt powerful of all the remote cauſes is juſtly thought to be the effluvia of marſhes replete with putrid animal-ſubſtances. We have not, however, been able to determine from what kind of putrid animal-ſubſtances theſe effluvia derive their virus. For that every kind of putrefaction has not ſuch an effect appears from this, that neither practical anatomiſts, nor thoſe who by their trades are expoſed to the putrid effluvia of animals, for inſtance ſuch tanners and butchers as keep their ſhops and ſtalls very dirty, are more ſubject than others to putrid diſeaſes. Nor are the ſhip ſtewards and their ſervants, whoſe buſineſs it is to deliver out their proviſions to the ſhips crews, and who ſpend the moſt of their time amongſt the putrid and rancid effluvia of the places in which thoſe proviſions are kept, more ſubject to putrid fevers than their ſhip-mates. But whatever be in this we are well aſſured that ſome particular putrid fermentations produce noxious vapours, which, united with thoſe of marſhes, render them more pernicious. Hence evidently proceeds the extreme unhealthfulneſs of a place called *Culpi*, on the eaſtern bank of the Ganges. The ſhores about it are full of mud, and the banks covered with trees. Oppoſite to the place where the ſhips lie there is a creek, and about a mile from its entrance ſtands the town of Culpi: the ſhips lie about a mile from the ſhore. None of the ſailors on board the ſhips ſtationed at this place enjoyed their health. The burying ground alſo contributed not a little to ſpread the infection. The ground being marſhy, the putrid water flowed from the old graves into the new ones, which infected the grave-diggers and thoſe that attended the funerals; and from this cauſe many were ſuddenly ſeized while they were performing the laſt duty to their companions. This place has ever been remarkable for the unhealthfulneſs of its air. It was once cuſtomary to ſend ſome of the Company's ſervants here to receive the cargoes of the ſhips, and ſend them to Calcutta; but ſo many of them died on this duty, that the Company was at length obliged to diſpenſe with it.

Hence it plainly appears, how apt putrid animal and vegetable ſubſtances are to render the effluvia of fenny places more pernicious than they would otherwiſe be. The reaſon why great inundations of the Nile and Ganges are followed by a healthy ſeaſon is, that by this means the putrid animal and vegetable ſubſtances diſperſed over the contiguous countries are carried off into the ſea.—The noxious vapours ariſing from fens ſpread but a little way. Dr Lind has often known ſhips crews at a very little diſtance from the ſhore quite free from this diſorder. But although theſe marſh miaſmata firſt bring on the diſeaſe, yet contagion particularly ſpreads it, and renders it more epidemic. Thus the Drake Eaſt Indiaman continued free from the diſorder for two weeks together, when ſhe had no communication with the other ſhips; whereas as ſoon as the diſorder was brought on board, many were ſeized with it within a few days in ſuch a manner as to leave no room to entertain the leaſt doubt concerning its peſtilential nature.

Dr Lind of Haſlar hoſpital has given a very curious and learned account of the appearance of this fever throughout the various parts of the globe. It was very common in England in the years 1765 and 1766, one obvious cauſe of which was the prevalence of the eaſterly wind. This wind in England is often ſaid to bring with it a fog from the ſea; but the truth of the matter is, that in many places of that iſland the eaſt-wind frequently raiſes a copious vapour from water, mud, and all marſhy or damp places. To this exhaling quality of the eaſterly wind Dr Lind has often been an eye-witneſs. When the wind changes to the eaſt, the mud ſometimes ſends up a vapour as thick as ſmoke; and the doctor has obſerved two fiſh-ponds in his neighbourhood one of freſh and the other of ſalt water, which on the approach of an eaſterly wind ſometimes alſo emit a denſe vapour, as from a pot of boiling water. In order to view this phenomenon diſtinctly, the perſon ſhould ſtand at about 100 yards diſtance from the mud or ponds. If the ſun ſhines when the wind changes to the eaſt, he will obſerve a conſtant ſteam of vapours ariſing out of the ponds, from about five to ten yards in height, while the air about him remains ſerene. As the vapour or fog ariſing from other bodies glides along the ſurface of the earth, and is brought by the eaſterly wind to the ponds, he will ſtill be able, for ſome time, to diſtinguiſh the vapours aſcending perpendicularly out of the ponds from thoſe which are carried in an horizontal direction by the wind: eſpecially if the ſun continues to ſhine, though faintly.

This evaporating quality of the eaſt wind ſeems to manifeſt itſelf alſo by its effects both on the thermometer and the human body; for a thermometer hung over a damp piece of ground during the fogs or exhalations ariſing from it, will often indicate a degree of cold below the freezing point. The chillineſs of the body, ſo ſenſibly perceived when in this ſituation, ſeems to proceed from the ſame cauſe, and to produce nearly the ſame ſenſations, which the damp ariſing from the wet floor in a chamber communicates to thoſe who happen to be in it.

Winds are not conſtant in their effects. As we have ſometimes warm weather with a north-wind, and ſometimes very little heat with one blowing from the ſouth; ſo the fogs attending an eaſt-wind are not conſtant, neither is the evaporation abovementioned at all times to be perceived. It is poſſible, however, that in all this there may be a deception; and that inſtead of ſuppoſing the quantity of vapours exhaled to be increaſed by an eaſterly wind, the coldneſs of that wind may only condenſe and render viſible the vapours in the air at that time. But even this ſuppoſition is liable to great objections, as our coldeſt north-winds ſeldom or never produce ſuch an effect, but on the contrary are attended with dry and ſerene weather.

Be this as it will, however, an eaſt-wind is uſually accompanied with a cold, damp, and unwholeſome vapour, which is obſerved to affect the health both of animals and vegetables, and in many places to produce obſtinate intermitting fevers, and alſo to occaſion frequent relapſes. In particular ſpots of the low damp iſland of Portſea, the ague frequently prevails during the autumnal ſeaſon, and in ſome years is much more frequent and violent than in others. It is alſo obſervable, that this diſeaſe always attacks ſtrangers, or thoſe who have formerly lived on a drier ſoil, and in a more elevated ſituation, with greater ſeverity than thoſe who are natives of the iſland.

The year 1765 was remarkable, not only for the long continuance of the eaſterly wind, but for an exceſſive degree of heat, which produced a more violent and general rage of thoſe diſeaſes than had been known for many years before. In the month of Auguſt the quickſilver in Fahrenheit's thermometer often roſe to 82° in the middle of the day. This conſiderable addition of heat, together with the want of refreſhing rains, greatly ſpread the fever, increaſed its violence, and even changed its form in many places. At Portſmouth, and throughout almoſt the whole iſland of Portſea, an alarming continual or remitting fever raged, which extended itſelf as far as Chicheſter. At the ſame time, the town of Goſport, though diſtant only one mile from Portſmouth, enjoyed an almoſt total exemption from ſickneſs of every kind; whereas in the neighbouring villages and farm-houſes, a mild regular tertian ague diſtreſſed whole families. The violence of the fever, with its appearances in a continued, remitting, or intermitting form, marked in ſome meaſure the nature of the ſoil. In Portſmouth the ſymptoms were bad, worſe at Kingſton, and ſtill more dangerous and violent at a place called *Half-way Houſes*; a ſtreet ſo named, about half a mile from Portſmouth, where ſcarcely one in a family eſcaped this fever, which generally made its firſt attack with a delirium. In the large ſuburb of Portſmouth called the *Common*, it ſeemed to rage with more violence than in the town, ſome parts excepted; but even whole ſtreets of this ſuburb, together with the houſes in the dock-yard, eſcaped the attack.

The Marines, who were three times a-week exerciſed early in the morning on South Sea beach, ſuffered much from the effect of the ſtagnant water in an adjoining moraſs. Half a dozen of them were frequently taken ill in their ranks when under arms; ſome being ſeized with ſuch a giddineſs of their head, that they could ſcarcely ſtand; while others fell down ſpeechleſs, and upon recovering their ſenſes complainſed of a violent head-ach. When ſuch patients were received into the hoſpital, it was obſerved that ſome few had a regular ague, but that far the greater number laboured under a remitting fever, in which ſometimes indeed there was no perceptible remiſſion for ſeveral days. A conſtant pain and giddineſs of the head were the moſt inſeparable and diſtreſſing ſymptoms of this diſeaſe. Some were delirious, and a few vomited up a quantity of bile; but in all the countenance was yellow. A long continuance of the fever produced a dropſy or jaundice, or both. Even a ſlight attack reduced the moſt robuſt conſtitution, to a ſtate of extreme debility; and this weakneſs, together with the giddineſs, continued for a long time after the fever. A ſcabby eruption now and then made its appearance on the lips and the corners of the mouth: but dry itchy ſpots over the whole body, reſembling much the common itch, and ſeeming to partake of the nature of that diſeaſe, were more frequently obſerved in the patients at Portſmouth, where there was not the leaſt reaſon to ſuſpect any infection.

Such is the appearance of the remitting fever occaſioned by marſh miaſmata in England. In the Netherlands its ſymptoms are not much different. Dr Wind informs us, that at Middleburg, the capital of Weſt Zealand, a ſickneſs generally reigns towards the latter end of Auguſt, or the beginning of September, which is always moſt violent after hot ſummers. It commences after the rains which fall in the end of July; the ſooner it begins the longer it continues, and it is only checked by the coldneſs of the weather. Towards the end of Auguſt and the beginning of September it is a continual burning fever, attended with a vomiting of bile, which is called the *gall ſickneſs*. This fever, after continuing three or four days, intermits, and aſſumes the form of a double tertian; leaving the patient in a fortnight, or perhaps ſooner. Strangers that have been accuſtomed to breathe a dry pure air do not recover ſo quickly. Foreigners in indigent circumſtances, ſuch as the Scots and German ſoldiers, who are garriſoned in the adjacent places, are apt after thoſe fevers to have a ſwelling in their legs and a dropſy; of which many die.

Theſe diſeaſes, the Doctor obſerves, are the ſame with the double tertians common within the tropics. Such as are ſeized with the gall-ſickneſs have at firſt ſome fluſhes of heat over the body, a loſs of appetite, a white foul tongue, a yellow tinct in the eyes, and a pale colour in the lips. Such as live well, drink wine, and have warm clothes and good lodgings, do not ſuffer ſo much during the ſickly ſeaſon as the poor people; however, theſe diſeaſes are not infectious, and ſeldom prove mortal to the natives.

Sir John Pringle obſerves, that the prevailing epidemic of autumn in all marſhy countries, is a fever of an intermitting nature, commonly of a tertian form, but of a bad kind; which, in the dampeſt places and worſt ſeaſons, appears as a double tertian, a remitting, or even an ardent fever. But however theſe fevers may vary in their appearance according to the conſtitution of the patient and other circumſtances, they are all of a ſimilar nature. For though, in the beginning of the epidemic, when the heat or rather the putrefaction in the air is the greateſt, they aſſume a continued or a remitting form, yet by the end of autumn they uſually terminate in regular intermittents.

In Zealand, where the air is more corrupted than in other parts of the Netherlands, this diſtemper, as we have already obſerved, is called the *gall-ſickneſs*; and indeed both the redundance and depravation of the gall is ſometimes ſo great, that it has been generally aſcribed to the corruption and overflowing of that humour. But though it cannot with juſtice be ſaid to originate from corrupted gall or bile, it is certain that the diſeaſe may be continued, and the ſymptoms aggravated, by an increaſed ſecretion and putrefaction of the bile occaſioned by the fever. In proportion to the coolneſs of the ſeaſon, to the height and dryneſs of the ground, this diſtemper is milder, remits or intermits more freely, and removes further from the nature of a continued fever. The higher ranks of people in general are leaſt liable to the diſeaſes of the marſhes; for ſuch countries require dry houſes, apartments raiſed above the ground, moderate exerciſe, without labour in the ſun or evening damps, a juſt quantity of fermented liquors, plenty of vegetables, and freſh meats. Without ſuch helps, not only ſtrangers, but the natives themſelves are ſickly, eſpecially after hot and cloſe ſummers. The hardieſt conſtitutions are very little excepted more than others; and hence the Britiſh in the Netherlands have always been ſubject to fevers.

By this diſtemper the Britiſh troops were haraſſed throughout the whole of the war from 1743 to 1747. It appeared in the month of Auguſt 1743; the paroxyſms came on in the evening, with great heat, thirſt, a violent headach, and often a delirium. Theſe ſymptoms laſted moſt of the night, but abated in the morning, with an imperfect ſweat, ſometimes with an hæmorrhagy of the noſe or a looſneſs. The ſtomach from the beginning was diſordered with a nauſea and ſenſe of oppreſſion, frequently with a bilious and offenſive vomiting. If evacuations were either neglected, or too ſparingly uſed, the patient fell into a continued fever, and ſometimes grew yellow as in a jaundice. When the ſeaſon was further advanced, this fever was attended with a cough, rheumatic pains, and ſizy blood. The officers being better accommodated than the common men, and the cavalry who had cloaks to keep them warm, were not ſo ſubject to it: and others who belonged to the army, but lay in quarters, were leaſt of all affected; and the leſs in proportion to their being little expoſed to heats, night-damps, and the other fatigues of the ſervice.

In this manner did the remitting fever infeſt the army for the remaining years of the war; and that exactly in proportion to their diſtance from the marſhy places, of which we have ſeveral notable inſtances in Pringle's obſervations. In Hungary the ſame diſeaſe appears with ſtill more violence, and is readily complicated with fevers of a truly peſtilential nature, by which means it becomes extremely dangerous. Hungary is acknowledged to be the moſt ſickly climate in Europe, and indeed as bad as any in the world. Here it was where the cruſaders, in only marching through the country to invade Aſia, often loſt half their number by ſickneſs; and where the Auſtrians not long ſince buried, in a few years, above 40,000 of their beſt troops, who fell a ſacrifice to the malignant diſpoſition of the Hungarian air. The reaſon of this uncommon malignity is, that Hungary abounds with rivers, which, by often overflowing, leave that low flat country overſpread with lakes and ponds of ſtagnating water, and with large unwholeſome marſhes. So great is the impurity of theſe ſtagnated waters, that by them the rivers, even the Danube, whoſe courſe is ſlow, becomes in ſome places corrupted and offenſive. The air is moiſt, and in ſummer quite ſultry. In the nights of harveſt, Kramer tells us, it was ſo very damp, that the Auſtrian ſoldiers could not ſecure themſelves from the moiſture even by a triple tent-covering. Here epidemical diſtempers begin conſtantly to rage during the hotteſt months of the year; which are July, Auguſt, and September: and theſe complaints, according to the obſervations of the phyſician abovementioned, are the ſame with thoſe which are epidemic upon the coaſt of Guinea, and in the ſickly climates of the Eaſt and Weſt Indies, of which malignant fevers of the remitting and intermitting kind are the the moſt common and dangerous.

The heat of the ſun in Hungary, according to the ſame author, is more intenſe than in any other country of Europe; and in proportion to the heat is the peſtilential quality of the marſhy exhalations. It is conſtantly obſerved, that the nearer any city or fort is to a moraſs or a large river with foul and oozy banks, the more unhealthy are the inhabitants. At ſuch ſeaſons and places, the air ſwarms with numberleſs inſects and animalcules, a ſure ſign of its malignant diſpoſition; and the hotter the ſummer, the more frequent and mortal are the diſeaſes. In ſhort, this country, on account of its unhealthineſs, has been termed *the grave of the Germans*; and in Italy, the Campania of Rome is almoſt equally unhealthy. Lanciſius, phyſician to Pope Clement XI. furniſhes us with a very ſtriking inſtance of the malignant quality of the air of Campania. Thirty gentlemen and ladies of the firſt rank in Rome having made an excurſion, upon a party of pleaſure, towards the mouth of the Tyber, the wind ſuddenly ſhifting blew from the ſouth over the putrid marſhes, when 29 were immediately ſeized with a tertian fever, only one eſcaping.

The iſland of Sardinia is annually viſited with an epidemical ſickneſs, which rages from June to September, and is called by the natives the *intemperies*. In ſome years there is a want of rain for four or five months; and then it is that this ſickneſs exerts its utmoſt violence, being always more fatal in ſome places than in others, and in particular to ſtrangers. Of this the Britiſh had a ſevere proof in 1758.—Admiral Broderick, in the Prince ſhip of war, anchored in the bay of Oriſtagni, where 27 of his men, ſent aſhore on duty, were ſeized with the epidemical diſtemper of this iſland; twelve of them in particular, who had ſlept on ſhore, were brought on board delirious. All of them in general laboured under a low fever, attended with great oppreſſion at the breaſt and at the pit of the ſtomach, a conſtant retching, and ſometimes a vomiting of bile; upon which a delirium often enſued. Theſe fevers changed into double tertians, and terminated in obſtinate quartan agues. It is worthy of remark, that in this ſhip, which lay only two miles from the land, none were taken ill but ſuch as had been on ſhore, of whom ſeven died. The prior of a convent, making a viſit to the Engliſh officers, informed them, that the intemperies of the iſland was a remitting or intermitting fever, and that he himſelf had ſuffered ſeveral attacks of it. Sardinia was formerly ſo remarkable for its unwholeſome air, that the Romans uſed to baniſh their criminals thither; and it is at preſent but thinly peopled, owing to the mortality occaſioned by this annual ſickneſs. For although it is about 140 miles long, and in ſeveral places 75 miles broad, yet it is computed that the whole number of its inhabitants does not exceed 250,000: an inconſiderable number, when compared with the inhabitants of the leſſer, but comparatively more healthful, iſland of Corſica; though even there the French loſt a number of their troops by intermitting and remitting fevers.

vers. In the iſland of Minorca, too, Dr Cleghorn informs us, that fevers of this kind prevail exceedingly; that their types are various, their ſymptoms violent, the intermiſſions fallacious, and that they frequently and ſuddenly prove fatal. It is more than probable, he adds, from the accounts of ſeveral phyſicians and travellers, that epidemical tertians are not wholly confined to the coaſts and iſlands of the Mediterranean, but that they are equally frequent and deſtructive in many other parts of the globe; and perhaps may be deemed the anniverſary autumnal diſtempers of moſt hot countries in the world. And though in the mild climate of Britain, a tertian may always eaſily be cured when once it is diſcovered; yet in warm climates, ſuch is the rapid progreſs of the diſtemper, that it is neceſſary to know it in the very beginning, which is very difficult for thoſe who have never ſeen any but the tertians uſually met with in Britain.

From Dr Cleghorn's account of Minorca, however, it doth not appear why that iſland ſhould be ſo much infeſted with fevers of this kind, ſince it is far from being a marſhy country; nay, on the contrary, it is very dry. The ſouth wind, he obſerves, is very unhealthy; and it is the prevalence of this wind which brings on the fever: but ſtill the difficulty is not removed, becauſe the ſea-air is ſo far from bringing on ſuch dangerous diſeaſes, that it is one of the greateſt preſervatives againſt them when it can be had. As to the moiſture which muſt neceſſarily accompany an inſular ſituation, that cannot reaſonably be admitted as a cauſe of this or any other diſeaſe. In the London Medical Obſervations we find a paper on a ſubject very ſimilar to the preſent, namely, the miſchiefs produced by lying in damp ſheets, or being expoſed to moiſt vapour. The author tells us, that he hardly knows a diſtemper the origin of which hath not by ſome been aſcribed to lying in a damp bed, or ſitting in a wet room; and yet he does not know any one which will certainly be produced by theſe cauſes, and people frequently expoſe themſelves to ſuch cauſes without ſuffering any ill effects. “It muſt be owned indeed, (ſays he), that the vapours ariſing from the bilge-water of ſhips tend to produce a ſcurvy. The ſwampy plains alſo near the mouths of great rivers which are often overflowed, and low grounds which cannot readily be drained, and thoſe tracts of land where the thickneſs and extent of the woods keep the ground moiſt and half putrid for want of ventilation, are deſtructive to the neighbouring inhabitants, by occaſioning obſtinate intermittents in the colder climates, and peſtilential fevers in the hotter regions. But all this miſchief ariſes not merely from moiſture, but from an unventilated and putrid moiſture; for the inoffenſiveneſs of mere wetneſs, untainted with putridity, may be reaſonably inferred from the following conſiderations. The air is often fully ſaturated with moiſture, and could not be more filled by the vapours ariſing from a chamber covered with water; and yet neither is any epidemical diſtemper produced by it, nor are thoſe remarkably aggravated with which the ſick happen at that time to be afflicted. The air from rivers and from the ſea is probably more repleniſhed with vapours than inland countries cleared of their woods: yet the moſt celebrated of the ancient phyſicians recommended the bank of a running river for the ſituation of a houſe, on account of its peculiar healthfulneſs; and many invalids are ſent by the modern phyſicians to the ſea ſide, only for the benefit of the ſea air.

“Where the ſailors are cleanly, and not too much crowded, they are often as healthy during long voyages at ſea, as they would have been upon any part of the land. Venice is not obſerved to be leſs healthy than London or Paris.

“Thoſe who are much diſpoſed to ſweat, lie many hours in bed-clothes impregnated probably with a leſs wholeſome moiſture than would have been left in the ſheets half-dried after waſhing; and I have not yet had reaſon to think that any remarkable injury was done to the health by the continuance of ſuch ſweats almoſt every night for weeks, and for months, except what aroſe from the too great copiouſneſs of this evacuation.

“Children, and ſuch as are troubled with the ſtone, and thoſe who, from other infirmities or age, conſtantly wet their beds with their urine, do not appear to ſuffer in their health on this account.

“It is a common practice, in ſome diſorders, to go to bed with the legs or arms wrapped in linen cloths thoroughly ſoaked in Malvern water, ſo that the ſheets will be in many places as wet as they can be; and I have known theſe patients and their bedfellows receive no harm from a continuance of this practice for many months. Nor can it be ſaid that the Malvern water is more innocent than any other water might be, on account of any ingredients with which it is impregnated; for the Malvern water is purer than that of any other ſpring in England which I ever examined or heard of.

“The greateſt valetudinarians do not ſcruple to ſprinkle lavender-water upon their ſheets; and yet, when the ſpirit is flown off, there is left what is as truly water as if it had been taken from the river.

“Is it obſerved, that laundreſſes are peculiarly unhealthy above other women, though they live half their time in the midſt of wet linen, in the air fully ſaturated with vapours? Many other employments might be mentioned, the perſons occupied in which are conſtantly expoſed to wet floors or pavements, or to be ſurrounded with watery vapours, or to have their clothes often wet for many hours together.

“Is it the coldneſs of wet linen which is to be feared? But ſhirts and ſheets, colder than any unfrozen water can be, are ſafely worn and lain in by many perſons, who, during a hard froſt, neither warm their ſhirts nor their ſheets.—Or does the danger lie in the dampneſs? But then how comes it to paſs, that a warm or cold bath, and long-continued fomentations, can be uſed, without the deſtruction of thoſe who uſe them? Or is it for both together? Yet we have long heard of the thickneſs and continuance of the cold fogs in the ſeas north-weſt of England, but have never yet been told of any certain ill effect which they have upon thoſe that live in theſe countries.”

With regard to the cauſes of fevers, however, Dr Lind is of opinion, that noxious vapours ariſing from the earth are for the moſt part to be blamed. Even in countries ſeemingly dry, and where violent rains are not frequent, he thinks that the air may load itſelf with putrid exhalations from the ground; and that, except in the burning deſarts of Arabia or Africa, people are nowhere exempt from diſeaſes occaſioned by putrid moiſture. In moſt of the hot countries, however, the pernicious effects of the putrid vapours are by no means equivocal. In Guinea, they ſeem to be more extraordinary than any where elſe in the world; neither indeed can it be ſuppoſed, that a hot and moiſt atmoſphere can be without putreſcency. It may in general be remarked, that in ſultry climates, or during hot weather, in all places ſubject to great rains, where the country is not cleared and cultivated, but is over-run with thickets, ſhrubs, or woods, eſpecially if there are marſhes or ſtagnating waters in the neighbourhood, ſickneſs may be dreaded, and particularly the remitting fever of which we now treat. The fens, even in different counties of England, are known to be very prejudicial to the health of thoſe who live near them, and ſtill more ſo to ſtrangers; but the woody and marſhy lands in hot countries are much more pernicious to the health of Europeans. In all thoſe unhealthy places, particularly during fogs or rains, a raw vapour, diſagreeable to the ſmell, ariſes from the earth, and eſpecially in the huts or houſes. But of all the vapours which infeſt the torrid zone, the moſt malignant and fatal are the *harmattans:* They are ſaid to ariſe from the conflux of ſeveral rivers in the king of *Dormeo's* dominions at Benin (the moſt unwholeſome part of Guinea), where travellers are obliged to be carried on mens backs for ſeveral days journey, through ſwampy grounds, and over marſhes, amidſt ſtinking ooze, and thickets of mangrove trees which are annually overflown. Theſe vapours come up the coaſt to a ſurpriſing diſtance, with the ſouth-eaſt and north-eaſt winds: and it has been obſerved, that in their progreſs they have often changed both the courſe of the winds and of the ſea currents. The times of their appearance at Cape Coaſt are the months of December, January, or February. The north-eaſt and ſouth-eaſt winds are always unhealthy, but particularly ſo during the harmattan ſeaſon. Some years this vapour is ſcarcely perceptible; but in others it is thick, noxious, and deſtructive to the blacks as well as whites.—The mortality is in proportion to the denſity and duration of the fog. It has a raw putrid ſmell; and is ſometimes ſo thick, that a perſon or houſe cannot be diſcerned through it, at the diſtance of 15 or 20 yards: and it continnes ſo for 10 or 15 days; during which it opens the ſeams of ſhips, ſplits or opens the crevices of wood as if ſhrunk or dried with a great fire, and deſtroys both man and beaſt. In the year 1754 or 1755, the mortality occaſioned in Guinea by this ſtinking fog was ſo great, that in ſeveral negro towns the living were ſcarce ſufficient to bury the dead.—Twenty women brought over from Holland by a new governor to the Caſtle *del Mina*, periſhed, together with moſt of the men in the garriſon. The gates of Cape Coaſt caſtle were ſhut up for want of centinels to do duty; the blacks dying at this time as well as the white people. It is lucky that it is only in ſome years that *harmattans* are ſo very thick and noxious, otherwiſe that part of the country would be depopulated. It is obſerved that all fogs are extremely unhealthy in thoſe parts, particularly before and after the rainy ſeaſons; but the above account of the *harmattans* appeared ſo very extraordinary and incredible to ſome of Dr Lind's readers, that he thought proper to publiſh a further corroboration of the facts above-mentioned. "A gentleman (ſays he), who had long reſided at Cape Coſte caſtle, informed me, that during the time of this fog, being in the upper chambers of the fort, the boards of the floor ſhrunk ſo much, that he could diſcern the candles burning in the apartments below him (there are no plaſter ceilings uſed in thoſe hot countries), and that he could then even diſtinguiſh what people were doing in the apartments below; the ſeams of the floor having opened above half an inch, while the fog laſted which afterwards, upon its being diſpelled, became cloſe and tight as before."

In this country the rains and dews ſeem to be poſſeſſed of qualities almoſt equally pernicious with the fogs. This much is certain, that in Guinea, many of the principal negroes, and eſpecially of the mulattoe Portugueſe, take the utmoſt precaution to avoid being wet with thoſe rains, eſpecially ſuch as fall firſt. At the ſetting in of the rainy ſeaſon, they generally ſhut themſelves up in a cloſe well-thatched hut, where they keep a conſtant fire, ſmoke tobacco, and drink brandy, as preſervatives againſt the noxious quality of the air at that time. When wet by accident with the rain, they immediately plunge themſelves into ſalt-water, if near it. Thoſe natives generally bathe once a-day, but never in the freſh water rivers when they are overflown with the rains: at ſuch times they prefer for that purpoſe the water of ſprings. The firſt rains which fall in Guinea are commonly ſuppoſed to be the moſt unhealthy. They have been known, in 48 hours, to render the leather of the ſhoes quite mouldy and rotten; they ſtain clothes more than any other rain; and ſoon after their commencement, even places formerly dry and parched ſwarm with frogs. At this time ſkins, part of the traffic of Senegal, quickly generate large worms; and it is remarked, that the fowls, which generally prey on other inſects, refuſe to feed on theſe. It has been farther obſerved, that woollen cloths wet in thoſe rains, and afterwards hang up to dry in the ſun, have ſometimes become full of maggots in a few hours.—It is alſo probable, that as in ſome of thoſe countries the earth, for ſix or eight months of the year, receives no moiſture from the heavens but what falls in dews, which every night renew the vegetation, the ſurface of the ground in many places becomes hard and incruſtated with a dry ſcurf, which pens up the vapours below: until by the continuance of the rains for ſome time, this cruſt is ſoftened, and the long pent up vapours ſet free. That theſe dews do not penetrate deep into the earth is evident from the conſtant dryneſs and hardneſs of ſuch ſpots of ground in thoſe countries as are not covered with graſs and other vegetables. Thus the large rivers in the dry ſeaſon being confined within narrow bounds, leaving a great part of their channel uncovered, which having its moiſture totally exhaled, becomes a ſolid hard cruſt; but no ſooner the rains fall, than by degrees this long parched up cruſt of earth and clay gradually ſoften, and the ground, which before had not the leſt ſmell, begins to emit a ſtench, which in four or five weaks becomes exceedingly noiſome, at which time the ſickneſs is generally moſt violent.

This ſickneſs, however, is not different from the remitting fever which has been deſcribed under ſo many various forms and names. An inflammatory fever is ſeldom obſerved, during the ſeaſon of ſickneſs, in this part of the world; and we ſhall conclude our deſcription of the *amphimerina paludoſa* with ſome extracts from the ſurgeon's journal of a ſhip that ſailed up the rivers of Guinea.

"On the 5th of April we ſailed up the river of Gambia, and found all the Engliſh in the fort in perfect health. The ſurgeons of the factory informed me, that a relaxation of the ſtomach, and conſequently a weakened digeſtion, ſeemed to bring on moſt of the diſeaſes ſo fatal to Europeans in the ſickly ſeaſon. They were generally of a bilious nature, attended with a low fever, ſometimes of a malignant, at other times of a remitting kind.—On the 12th of April, after ſailing 30 miles up the river St Domingo, we came to Catchou, a town belonging to the Portugueſe, in Lat. 20° N. In this town were only four white people, the governor and three friars. The number of whites in the trading ſhips were 51. One morning, towards the latter end of April, a little rain fell. On the 13th of May there was a ſecond ſhower, accompanied with a tornado. On the 18th of May it rained the whole day; and the rain continued, with but ſhort intervals, until the beginning of October.

"In the month of June, almoſt two-thirds of the white people were taken ill. Their ſickneſs could not be well characteriſed by any denomination commonly applied to fevers: it however approached neareſt to what is called a *nervous fever*, as the pulſe was always low, and the brain and nerves ſeemed principally affected. It had alſo a tendency to frequent remiſſions. It began ſometimes with a vomiting, but oftener with a delirium. Its attack was commonly in the night; and the patients, being then delirious, were apt to run into the open air. I obſerved them frequently recover their ſenſes for a ſhort time, by means of the heavy rain which fell upon their naked bodies. But the delirium ſoon returned: they afterwards became comatoſe, their pulſe ſunk, and a train of nervous ſymptoms followed; their ſkin often became yellow; bilious vomitings and ſtools were frequent ſymptoms. The fever reduced the patient's ſtrength ſo much, that it was generally ſix weeks or two months before he was able to walk abroad. A conſuming flux, a jaundice, a dropſy, or obſtructions in the bowels, were the conſequences of it. Of 51 white men, being the companies of four ſhips which were at Catchou, one-third died of the fever, and one-third more of the flux, and other diſeaſes conſequent upon it; and of theſe not one was taken ill till the rains began.

"I believe, on the whole face of the earth, there is ſcarce to be found a more unhealthy country than this during the rainy ſeaſon: and the idea I then conceived of our white people was by making a compariſon of their breathing ſuch a noxious air, with a number of river-fiſh put into ſtagnating water; where, as the water corrupts, the fiſh grow leſs lively, they droop, pine away, and many die.

"Thus ſome perſons became dull, inactive, or ſlightly delirious, at intervals; and, without being ſo much as confined to their beds, they expired in that delirious and comatoſe ſtate in leſs than 48 hours, after being in apparent good health. The white people in general became yellow; their ſtomach could not receive much food without loathing and retchings. Indeed it is no wonder that this ſickneſs proved ſo fatal, that recoveries from it were ſo tedious, and that they were attended with fluxes, dropſies, the jaundice, ague-cakes, and other dangerous chronical diſtempers. It ſeemed more wonderful to me that any white people recover, while they continue to breathe ſo peſtiferous an air as that at Catchou during the rainy ſeaſon. We were, as I have already obſerved, 30 miles from the ſea, in a country altogether uncultivated, overflowed with water, ſurrounded with thick impenetrable woods, and over-run with ſlime. The air was vitiated, noiſome, and thick; inſomuch that the lighted torches or candles burnt dim, and ſeemed ready to be extinguiſhed; even the human voice loſt its natural tone. The ſmell of the ground and of the houſes was raw and offenſive; but the vapour ariſing from putrid water in the ditches was much worſe. All this, however, ſeemed tolerable, when compared with the infinite numbers of inſects ſwarming every where, both on on the ground and in the air; which, as they ſeemed to be produced and cheriſhed by the putrefaction of the atmoſphere, ſo they contributed greatly to increaſe its impurity. The wild bees from the woods, together with millions of ants, over-ran and deſtroyed the furniture of the houſes; at the ſame time ſwarms of cockroaches often darkened the air, and extinguiſhed even candles in their flight; but the greateſt plague was the muſquettos and ſand-flies, whoſe inceſſant buzz and painful ſtings were more inſupportable than any ſymptom of the fever. Beſides all theſe, an incredible number of frogs on the banks of the river made ſuch a conſtant and diſagreeable croaking, that nothing but being accuſtomed to ſuch an hideous noiſe could permit the enjoyment of natural ſleep. In the beginning of October, as the rains abated, the weather became very hot; the woods were covered with abundance of dead frogs, and other vermin, left by the receſs of the river; all the mangroves and ſhrubs were likewiſe overſpread with ſtinking ſlime."

After ſo particular a deſcription of the remitting fever in many different parts of the world, we preſume it will be needleſs to take notice of any little varieties which may occur in the warm parts of America, as both the nature and cure of the diſtemper are radically the ſame; neither ſhall we lengthen out this article with further deſcriptions of remitting fevers from the works of foreign authors, as, from what we have already ſaid, their nature cannot well be miſtaken.

Cure. The great difficulty in the cure of remitting fevers ariſes from their not being ſimple diſeaſes, but a complication of ſeveral others. Fevers, properly ſpeaking, have but three or four different appearances which they can aſſume without a complication. One is, when they are attended with a phlogiſtic diatheſis; another is, when they aſſume the form of genuine intermittents; a third is, when they produce a great debility of the nervous ſyſtem; and the fourth is, when along with this debility there is alſo a rapid tendency to putrefaction. If, therefore, all theſe ſpecies happen to make an attack at once, the moſt dangerous fever we can imagine will be produced; and however contrary it may be to our theories to admit the poſſibility of ſuch an attack, the truth of the fact is too often confirmed by fatal experience. In the beginning of remittent fevers, for inſtance, the ſymptoms indicate a high degree of inflammation: but if the practitioner attempts to remove this inflammation by blood-letting or other evacuations, the pulſe ſinks irrecoverably, and the perſon dies with ſuch ſymptoms as ſhow that the nervous ſyſtem has been from the beginning greatly affected; at the ſame time the high ſtimulants and cordials, or the bark, which would have conquered the nervous part of the diſeaſe, increaſe the inflammatory part of it to ſuch a degree, that, by a too early exhibition of them the patient alſo dies, but after another manner.

In the remitting fever of the Eaſt Indies, Dr Lind of Windſor formed the following indications of cure. 1. To allay the violence of the fever. 2. To evacuate the putrid humours, and take great care to prevent the body from inclining to putrefaction. 3. To keep up the ſtrength of the patient as much as poſſible during the diſorder. 4. To loſe no time in preventing the return of the paroxyſms.

To allay the violence of the fever, every thing that can contribute to increaſe it ought to be carefully avoided or removed; ſuch as great heat, too ſtrong a light falling on the eyes, noiſe, and motion. If during the paroxyſm the head and loins be affected with violent pains, the pulſe be full and hard, and the heat intenſe, bleeding may be uſed, but with the greateſt caution: for, however uſeful this operation may be in cold climates, the ſucceſs of it in warm ones is ſo far from being certain, that the lives of the patients have been often very much endangered, nay even deſtroyed by it. Dr Badenoch, and the ſurgeon of the Ponſborne, endeavoured each of them to relieve two patients by blood-letting; and the conſequence was that each of them loſt one patient. Dr Lind bled two patients; one of whom was Mr Richardſon, the firſt mate of the ſhip, who complained of a moſt violent pain in his head with a full hard pulſe. About four or five ounces of blood were taken from him, by which he was greatly relieved: nor was the cure retarded by it; nay, the fever afterwards became leſs irregular. At the time the other patient was bled, the diſeaſe was exceedingly frequent and violent. He was ſo earneſt for bleeding, that he fired all the reſt with the ſame deſire, ſwearing, that by refuſing them this only remedy, every one of them would be ſent to their graves. To quiet them, therefore, and get quit of their importunities, the Doctor complied with their requeſt, and took about five or ſix ounces from him who had been the firſt to require it. The conſeqnence was, that he immediately loſt his ſtrength; and in leſs than an hour, during which time he made his will, was carried off by the next fit. It is neceſſary, however, to obſerve, and indeed the Doctor himſelf makes the obſervation, with regard to this patient, that he was bled at an improper time, namely, between the fits, whereas, had he been bled in the hot fit, it is poſſible he might have been relieved.

In ſupport of the advantages to be derived from bleeding under proper circumſtances, we have the authority both of Cleghorn and Pringle. As Dr Cleghorn practiſed in a very hot country, his obſervations muſt in the preſent caſe have greater weight than thoſe of Pringle, who practiſed in a colder one. The former acquaints us, that if he was called in early enough, unleſs there was a ſtrong contra-indication, he always uſed to take away ſome blood from people of all ages; namely, from robuſt adults, 10 or, 12 ounces; from others a ſmaller quantity, in proportion to their ſtrength and years. And further, if a violent head-ach, obſtinate delirium, and great heat or pains of the bowels, were urgent, the bleeding was repeated within a day or two. By this ſeaſonable evacuation, he found the vehemence of all the paroxyſms ſomewhat diminiſhed; the apyrexies became more complete; the operation of emetics and cathartics rendered ſafer and more ſucceſsful; and the terrible ſymptoms which happened about the height of the diſtemper, ſuch as raving *ſopor*, difficulty of breathing, inflammations of the abdominal viſcera, &c. were either prevented or mitigated. But if the fever had continued for ſome time before he was called, and the maſs of blood appeared to be too much melted down or inclined to a putrid diſſolution, he either abſtained from bleeding entirely, or took away a very ſmall quantity, though ſome importunate ſymptoms might ſeem to require a larger evacuation. As to the time of peforming the operation, he acquaints us, that it is ſafe enough, except when the cold fit laſts or is ſoon expected, or while the ſkin is covered with critical ſweats; and that he uſually opened a vein in the beginning of the hot fit; by which means the ſick were relieved, the immoderate heat of the body, which is often productive of fatal effects, was diminiſhed, and the critical ſweats brought on ſooner and in greater abundance.

But though Dr Lind found veneſection to be of ſuch pernicious tendency in his patients, cooling acidulated liquors were of the utmoſt ſervice, as they corrected the putrid humours, leſſened the heat and thirſt, and of courſe prevented the fever from arriving at ſo great an height as it would otherwiſe have done. Thoſe cooling liquors are the beſt which are made up with ſome farinaceous ſubſtance, as they moſt eaſily unite with our fluids. Foſſile acids too, and cryſtals of tartar, eſpecially the latter, are of conſiderable uſe, not only in this but in other fevers. The neutral ſalts, prepared with the juice of lemons, were likewiſe given with ſucceſs during the heat of the fever. They leſſen the nauſea, the fits become more regular, and the remiſſions more full; and they are particularly grateful when given in a ſtate of efferveſcence. The good effects of theſe draughts we are in a great meaſure to aſcribe to the antiſeptic quality of the fixed air extricated from them during the efferveſcence; of which we ſhall ſpeak more fully when ſpeaking of the typhous fevers.

During the remiſſion, it is proper to evacuate the putrid humours by ſmall doſes of ipecacuanha, or rather tartar emetic. The tartar emetic indeed appears to be endowed with ſome kind of febrifuge virtue, which Dr Cullen thinks is owing to its relaxing the febrile ſpaſm taking place in the capillary veſſels. But ſhould there appear any ſymptoms of a topical inflammation in ſome of the abdominal viſcera, a thing which never happens unleſs the diſorder has been of ſome ſtanding, vomiting is to be avoided, and we are to depend upon purgatives alone for the evacuation of the putrid bile, which are always uſeful in the cure of this diſorder. But all acrid and ſtrong purgatives are to be carefully avoided, and only the mild antiſeptic ones made uſe of, ſuch as cryſtals of tartar, or tamarinds made up with manna or with Glauber's ſalt.

Under the article GALL, we have obſerved, from Dr Percival, the effect which vegetable acids have in ſweetening putrid bile; whence it ſeems probable, that a liberal uſe of theſe acids would be much more ſerviceable than a repetition of any kind of purgatives. Though in theſe diſeaſes there is a great quantity of putreſcent bile collected in the body, yet it ſeems much more probable that this is the *effect* rather than the *cauſe* of the diſorder; and therefore, though we carry off the quantity collected ever ſo often, more of the ſame kind will ſtill be produced by the putreſcent diſpoſition of the other fluids, at the ſame time that the ſtrength of the patient muſt neceſſarily be diminiſhed by repeated evacuations, when it ought rather to be kept up by all poſſible means. We ought well to obſerve, however, that the mineral acids have not that property of ſweetening putrid bile which the vegetable ones have; and therefore the ſame relief will not be given by them which might reaſonably be expected from vinegar or lemon-juice.

In order to keep up the ſtrength of the patient, good food is abſolutely neceſſary. Dr Lind allowed the ſick ſmall meſſes of panada made with boiled rice and barley mixed with currants or raiſins and prunes, ſeaſoned with ſugar and a little wine, eſpecially claret. During the paroxyſms, they had gruel made of flour and rice, with ſugar and the juice of acid fruit; and when the fit went off, a little wine was added to this mixture.

The ſhirts and bedding muſt be very often changed and well aired; their ſtools, and all filth and naſtineſs, are to be immediately removed; the places where they are lodged ſhould be well aired and frequently ſprinkled with vinegar; and, in the laſt place, the ſick muſt be exceedingly well nurſed. Bliſters, according to Dr Lind, ſhould never be uſed till the fever has been of long continuance, or the ſpirits and pulſe of the patient have begun to flag. But here our author has implicitly followed Dr Huxham, whoſe theory concerning the uſe of bliſters is now found to be erroneous. According to that celebrated author, bliſters are capable of doing conſiderable hurt in all caſes where there is a tendency to inflammation, by increaſing the motion of the fluids and the oſcillatory power of the veſſels, both of which are already too great. They are alſo improper, according to him, where there is a conſiderable tendency of the fluids to putrefaction; becauſe he ſuppoſes the ſalts of theſe flies to operate in the ſame manner with volatile alkalies, that is, by diſſolving and putrefying the blood ſtill farther. But Sir John Pringle has ſhown, that, in inflammatory fevers as well as thoſe of the putrid kind, both bliſters and volatile ſalts may be of ſervice; the latter, particularly, he hath experimentally proved to be ſo far from promoting putrefaction, that they are exceedingly ſtrong antiſeptics.

In the Eaſt Indies, Dr Lind found it abſolutely neceſſary to exhibit the bark in large quantities, and as early as poſſible. By this method he not only ſecured the patient from the imminent danger of death to which he was expoſed at every fit, but likewiſe conquered thoſe obſtructions which were apt to enſue in the abdominal viſcera, and which are to be attributed to the continuance of the diſorder, and not to the bark employed to cure it. He always gave the bark during the ſecond remiſſion, as all his care was during the firſt to cleanſe the primæ viæ. He obſerves, however, that it is to no purpoſe to give the bark till the neceſſary purgations are over; but aſſures us, that it never fails, unleſs from the coming on of a vomiting or diarrhœa it cannot be taken in ſufficient quantities before the return of a paroxyſm. To prevent the medicine from vomiting or purging, he mixed a few drops of liquid laudanum with every doſe of it. Half a drachm was given every half hour in ſome convenient vehicle, beginning as ſoon as the fever had conſiderably abated, and the pulſe was returned nearly to its natural ſtate; both which generally happened before the ſweats were over. An ounce of the bark was ſometimes found too little to check the fever, but an ounce and a half never failed. It muſt be continued daily in ſmall doſes till the patient has recovered his ſtrength, and then a greater quantity muſt be given, eſpecially at the ſeaſon when the rivers overflow the country.

Dr Pringle found the autumnal remittents in the Netherlands complicated with a great many inflammatory ſymptoms; for which reaſon it was generally found neceſſary to open a vein in the beginning. The vernal and later autumnal remitting fevers are accompanied with pleuritic and rheumatic pains from the coldneſs of the weather, and on that account require more bleeding. A phyſician unacquainted with the nature of the diſeaſe, and attending chiefly to the paroxyſms and remiſſion would be apt to omit this evacuation entirely, and give the bark too ſoon, which would bring on a continued inflammatory fever. In theſe countries a vein may be ſafely opened either during the remiſſion or in the height of a paroxyſm; and our author alſo found good effects reſulting from bleeding in the hot fits of the marſh-fever, even after it had almoſt come to regular intermiſſions. After bleeding a purgative was uſually exhibited, of which he gives us the following formula.

R. Infuſi ſenæ commun. ℥iij.
Elect. Lenitiv. ℥ſs.
Nitr. pur. ʒi
Tinct. ſen. ʒvi. M.

Of this only one half was taken at once: and if it did not operate twice in four hours, the remainder was then taken. This potion agreed with the ſtomach, purged plentifully, and therefore was a very uſeful compoſition. Next morning, when there was almoſt always ſome remiſſion, he gave one grain of emetic tartar rubbed with 12 grains of crabs-eyes, and repeated the doſe in two hours, if the firſt had little or no effect; or at any rate in four hours. This medicine was intended not only to vomit, but alſo to operate by ſtool, and excite a ſweat. If theſe evacuations were procured, the fever generally became eaſier, and was even ſometimes cured. This he prefers to the ipecacuanha, and therefore in the latter years of his practice diſuſed that root entirely. The ſame medicine was repeated next day or the day following; or if not, a laxative clyſter was thrown in: and this method was continued till the fever either went off altogether, or intermitted in ſuch a manner as to be cured by the bark.

A ſimilar method was followed by Dr Huck in the remitting fevers of the Weſt Indies and North America. In the beginning he let blood; and in the firſt remiſſion gave four or five grains of ipecacuanha, with from half a grain to two grains of emetic tartar. This powder he repeated in two hours, taking care that the patient ſhould not drink before the ſecond doſe; for then the medicine more readily paſſed into the bowels after it had operated by vomiting. If after two hours more the operation either way was ſmall, he gave a third doſe, which commonly had a good effect in opening the firſt paſſages; and then the fever either went quite off, or intermitted in ſuch a manner as to yield to the bark. On the continent, he found little difficulty after the intermiſſion; but in the Weſt Indies, unleſs he gave the bark upon the very firſt intermiſſion, though imperfect, the fever was apt to aſſume a continued and dangerous form.

In the remitting fevers of hot countries, however, it muſt be obſerved, that the lancet muſt in all caſes be much more ſparingly uſed than in ſimilar diſeaſes of the colder regions; and we muſt alſo be ſparing of veneſection in thoſe countries where the marſh effluvia are very ſtrong and prevail much. For this reaſon Dr Lind of Haſlar greatly condemns the practice of indiſcriminate bleeding when people firſt arrive in hot climates. The firſt diſeaſes indeed which occur in a voyage to the ſouthward are for the moſt part of an inflammatory nature, and owing to a ſudden tranſition from cold to hot weather. This occaſions a fullneſs and diſtenſion of the veſſels; whence all Europeans, on their firſt arrival under the tropic, bear evacuations much better than afterwards. The practice of indiſcriminately bleeding, however, a number of the ſhip's company when they firſt come into a warm latitude, is by no means found to anſwer the purpoſe of a preventive. In ſuch caſes, indeed, as plainly indicate a plethoric diſpoſition brought on by the heat, blood-letting is certainly uſeful. The ſigns of this are a pain and giddineſs in the head; a heavineſs and dulneſs of the eyes, which ſometimes appear ſlightly inflamed: there is alſo commonly a ſenſe of weight and fulneſs in the breaſt, the pulſe at the ſame time being quick and oppreſſed.

But the caſe is quite different after a longer continuance of ſultry weather, and when the conſtitution is in ſome meaſure habituated to the hot climate. For it is then obſerved, that the ſymptoms of inflammations in the bowels, even the moſt dangerous, are not near ſo ſevere in ſuch climates as in cold countries; nor can the patients bear ſuch large evacuations. The phyſician, however, muſt take care not to be miſled by the apparent mildneſs of the ſymptoms: for he will find, notwithſtanding ſuch deceitful appearances, that the inflammation makes a more rapid progreſs in hot countries than in cold, ſuppurations and mortifications being much more ſuddenly formed; and that in general all acute diſtempers come ſooner to a criſis in the warm ſouthern than in colder regions. Hence it is an important rule of practice in thoſe climates, to ſeize the moſt early opportunity, in the commencement of all threatening inflammations, to make frequent though not copious evacuations by blood-letting. For by delay the inflammation quickly paſſes from its firſt to its laſt or fatal ſtage; at leaſt an imperfect criſis in ſuch inflammatory fevers enſues, which fixes an obſtruction in the viſcera extremely difficult to remove.

It is indeed a general maxim with ſome phyſicians in the Weſt Indies, that in moſt acute diſtempers bleeding in that country is prejudicial. This is founded upon a ſuppoſition that the craſſamentum of the blood is thinned, and the ſolids greatly weakened, by the heat of the climate. It is therefore objected, that bleeding in ſuch an habit of body weakens the powers of nature, and withdraws the ſtrength which is requiſite to ſupport the patient until the criſis of the fever.

This reaſoning is partly juſt; but, like all general maxims, will admit of exceptions. Firſt with regard to ſailors, it is to be remembered, that they are more expoſed to quick viciſſitudes of heat, cold, damps, and to various changes of the air and weather, than moſt of the other inhabitants of the Torrid Zone. Add to this, that their intemperance, and the exceſſes they are apt to fall into whenever it is in their power to commit them, render them more liable to inflammations than any other ſet of people. Hence their diſeaſes require more plentiful evacuations than the land-inhabitants of thoſe parts of the world, and generally they bear them better. But with regard to the natives of the country, or thoſe who have remained long there, it muſt be proper to bleed them very ſparingly, making a ſmall allowance for the different ſeaſons of the year, the temperature of the air, and the ſituation of the places where they reſide. Thus, in ſome parts, even on the iſland of Jamaica, at particular ſeaſons, the weather is cool; wherefore, in theſe places, and at ſuch ſeaſons, the inhabitants having their fibres more rigid, and a firmer craſis of their blood, bear veneſection much better.

In cold countries the ſtate of the air greatly aſſiſts in reſtoring the impaired ſpring of the fibres; whereas every thing almoſt in warm weather, ſuch as heat, moiſture, &c. concur to relax and weaken the habit of body. Thus we may daily ſee perſons in Britain, after having ſuffered a moſt ſevere fit of ſickneſs, recover their ſtrength and ſpirits in a few days, and in a very ſhort time their natural conſtitution. But the caſe is very different in the ſultry regions of the Torrid Zone, or indeed in any part of the world where the heat of the ſeaſon cauſes the mercury to ſtand for any length of time at the 77th degree and upward of Fahrenheit's thermometer. During ſuch an exceſs of heat, debility after fevers is apt to remain with European conſtitutions for ſeveral months. In Jamaica, the convaleſcents are ſent to the cool ſummits of the mountains; but a retreat to a more northern climate is often abſolutely neceſſary to recover their wonted tone and vigour of body. It is a well-eſtabliſhed obſervation, that the negroes and aborigines of the Torrid Zone cannot bear plentiful evacuations by the lancet. They commonly mix the moſt ſtimulating poignant ſpices with their ordinary light food, and this is found by experience ſuitable to their conſtitutions.

As proper preventives for the dangerous fevers of which we are treating, Dr Lind on all occaſions recommends the avoiding of ſtagnant water, or putrid marſhes; the uſe of proper food, cleanlineſs, and ſobriety. Of the propriety of removing from the neighbourhood of thoſe places whoſe peſtilential effluvia produce the diſorders, we cannot poſſibly entertain a doubt; and of the efficacy of proper food in preventing putrid diſorders he gives a remarkable inſtance in the Sheerneſs man of war, bound to the Eaſt Indies. As they went out, the men being apprehenſive of ſickneſs in ſo long a voyage, petitioned the captain not to oblige them to take up their ſalt proviſions, but rather to permit them to live upon the other ſpecies of their allowance. It was therefore ordered, that they ſhould be ſerved with ſalt-meat only once a-weak; and the conſequence was, that, after a paſſage of five months and one day, the ſhip arrived at the Cape of Good Hope without having a ſingle perſon ſick on board. As the uſe of Sutton's pipes had been then newly introduced into the king's ſhips, the captain was willing to aſcribe part of ſuch an uncommon healthfulneſs to their beneficial effects; but it was ſoon diſcovered, that, by the neglect of the carpenter, the cock of the pipes had been all this while kept ſhut. This ſhip remained in India ſome months, where none of the men, except the boat's crew, had the benefit of going on ſhore; notwithſtanding which, the crew continued to enjoy the moſt perfect ſtate of health; they were, however, well ſupplied with freſh meat. On leaving India, knowing they were to ſtop at the Cape of Good Hope, and truſting to a quick paſſage, and the abundance of refreſhments to be had there, they eat their full allowance of ſalt-meats, during a paſſage of only 10 weeks; and it is to be remarked the air-pipes were now open. The effect of this was, that when they were arrived at the Cape, 20 of them were afflicted in a moſt miſerable manner with ſcorbutic and other diſorders. Theſe, however, were ſpeedily recovered by the refreſhments they met with on ſhore. Being now thoroughly ſenſible of the beneficial effects of eating, in theſe ſouthern climates, as little ſalt meat as poſſible when at ſea, they unanimouſly agreed, in their voyage home from the Cape, to refrain from their too plentiful allowance of ſalt fleſh. And thus the Sheerneſs arrived at Spithead, with her full complement of 160 men in perfect health and with unbroken conſtitutions; having in this voyage of 14 months and 15 days buried but one man, who died in a mercurial ſalivation.

Thus we ſee, that a free and pure air is not a ſufficient preſervative againſt a putreſcent ſtate of the fluids, without proper food; and, on the other hand, we have a very remarkable inſtance of the inefficacy of the moſt ſalutary food to prevent putrid diſeaſes, in a very noxious ſtate of the atmoſphere. In the year 1717, at the ſiege of Belgrade in Hungary, the fever of the country, and the flux, occaſioned a moſt extraordinary mortality among the troops. The dread of theſe diſeaſes cauſed every one, as may naturally be ſuppoſed, to have recourſe to different precautions for ſelf-preſervation. Prince Eugene, the commander in chief, had water and the proviſions for his table ſent him twice a-week from Vienna. The pure ſtream of the river Kahlenberg was regularly brought to him: he avoided all exceſſes, and lived regularly, or rather abſtemiouſly; refreſhed himſelf often by eating a cool melon; and mixed his uſual wine, which was Burgundy, with water. Yet notwithſtanding his utmoſt care, he was ſeized with a dyſentery; which would have quickly put an end to his life, had not the ſpeedy concluſion of that campaign permitted him to make a quick retreat.

At this unhealthy ſeaſon, when hardly one imperial officer, much leſs their ſeveral domeſtics, eſcaped thoſe malignant diſeaſes, the renowned Count Bonneval and his numerous retinue continued in perfect health, to the ſurpriſe, or, to uſe the words of Dr Kramer, to the *envy*, of all who beheld him. The only precaution he uſed was to take, two or three times a-day, a ſmall quantity of brandy in which the bark was infuſed; and he obliged all his attendants and domeſtics to follow his example. It is no leſs remarkable that the count, placing his certain preſervation in the uſe of this ſingle medicine, lived for many years afterwards in the moſt unhealthy ſpots of Hungary, without any attack or apprehenſion of diſeaſe; and continued to enjoy a perfect ſtate of health during the hotteſt and moſt ſickly ſeaſons. And thus, with an unbroken and ſound conſtitution, which is ſeldom the caſe of thoſe who reſide long in ſuch climates, he lived to a great age. There is an inſtance produced by the ſame author of a whole regiment in Italy having been preſerved by the uſe of the bark from the attack of theſe malignant diſeaſes, viz. the flux, and *bilious* fever as it is frequently called, when the reſt of the Auſtrian army, not purſuing that method, became greatly annoyed with them.

The intemperance and irregular living of thoſe Europeans who viſit the hot climates is frequently accuſed as the cauſe of their deſtruction; but, our author thinks, without ſufficient reaſon: for though intemperance will make the body more liable to receive ſuch diſeaſes, it will not bring them on. It muſt by no means, however, be imagined, that in theſe climates Europeans may with impunity be guilty of exceſſes in eating or drinking; for the leaſt error in that way will often prove fatal by debilitating the body, whoſe utmoſt ſtrength in time of full health was perhaps ſcarce ſufficient to reſiſt the peſtilential miaſmata of the atmoſphere.

It appears, therefore, from the concurrent teſtimony of the moſt eminent phyſicians, that the moſt proper medicine to be uſed, either as a preventive or cure for remitting and intermitting diſorders is the Peruvian bark, adminiſtered with proper precautions, and after the *primæ viæ* have been evacuted of the putrid bilious matter collected in them. In thoſe ſpecies of *tritæophya*, &c. belonging to this claſs, enumerated by Sauvages, the ſame remedies only were uſeful; but in that peſtilential diſtemper which he calls *tritæophya Vratiſlavienſis*, he tells us, that waſhing the body with water ſometimes hot ſometimes cold, watery clyſters, and plenty of aqueous drink, were likewiſe of uſe.

Genus II. QUARTANA; the Quartan Fever. 153

Quartana auctorum, *Sauv.* Gen. 89. *Lin.* 17. *Vog.* 3. *Sag.* 711. *Hoffm.* II. p. 23. *Junck.* tab. 81.

The *Genuine* Quartan. Sp. I. var. 1. A.

Quartana legitima, *Sauv.* ſp. 1. *Sydenham* de morb. acut. cap. v.

Deſcription. The genuine quartan, according to Juncker, keeps its form more exactly than other intermittents; ſcarcely coming on at any other time than four or five in the afternoon. The cold is leſs violent than in the tertian; but is very perceptible, though it doth not proceed to ſuch a height as to make the limbs ſhake; and continues for about two hours. It is preceded and accompanied by a langour both of body and mind. There is ſeldom any vomiting unleſs when the ſtomach is manifeſtly overloaded with aliment; neither is their any diarrhœa, but the belly in general is rather bound, not only on the days on which the paroxyſm takes place, but alſo on the intermediate ones. The heat, which ſlowly ſucceeds the cold, is leſs troubleſome to the patient by its violence than by the uneaſy dryneſs of the ſkin, which is ſcarce ever moiſtened with ſweat. This heat rarely continues longer than four or ſix hours, unleſs perhaps at the firſt or ſecond paroxyſm. It is accompanied alſo with a giddineſs and dull pain of the head. On the termination of the paroxyſm, the patient returns to a middling ſtate of health, and continues in the ſame for the reſt of the intermediate days; only there remains ſomewhat of a loathing, and a deep-ſeated pain as if the perſon was all over bruiſed or broken, which kind of ſenſation the phyſicians are wont to call *oſteocopus.* The fit returns every fourth day, and that preciſely at the ſame hours, being rarely poſtponed.

Cauſes of, and perſons ſubject to, this Diſorder. The ſame general cauſes concur in producing this as in other intermittents, namely marſh miaſmata, and whatever can diſpoſe the body to be eaſily affected by them. Studious people, and thoſe of a melancholic turn, are ſaid to be particularly ſubject to quartans; but what are the immediate cauſes which produce a return of the fits every fourth day, inſtead of every day, or every third day, muſt probably lie for ever concealed, as depending upon the ſecret and inexplicable mechaniſm of the human body.

Prognoſis. A ſimple quartan, where there is no reaſon to dread any induration of the viſcera, may very certainly admit of a cure; and the prognoſis can never be unfavourable, unleſs in caſes of extreme weakneſs, or where the diſtemper hath been unſkilfully treated.

Cure. This does not in the leaſt differ from that which hath been fully laid down for the ſimple tertian, and which it is needleſs therefore to repeat here.

The *Duplicated* QUARTAN. Sp. I. var. 1. B.

154 Quartana duplicata, *Sauv.* ſp. 4. *Bonet.*

This is entirely ſimilar to the duplicated tertian already mentioned; proper allowance being made for the difference between the type of a tertian and quartan.

The *Triplicated* QUARTAN. Sp. I. var. 1. C.

155 Quartan triplicata, *Sauv.* ſp. 16.

This hath three paroxyſms every fourth day, while the intermediate days are entirely free from fever.

The *Double* QUARTAN. ſp. I. var. 1. D.

156 Quartana duplex, Sauv ſp. 3, *Vog.* ſp. 13.

In the double quartan, the fits come on every day except the third; but ſo that the firſt paroxyſm anſwers to the third, the ſecond to the fourth, and ſo on.

The *Triple* QUARTAN. Sp. I. var. 1. E.

Quartana triplex, *Sauv.* ſp. 5. *Vog.* ſp. 14. *Bartholin.* H. anat. c. 1. 95. 157

This comes on every day, but the quartan type is ſtill preſerved by the times of acceſſion; that is, the time of the fourth paroxyſm's coming on anſwers to that of the firſt, the fifth to the ſecond, the ſixth to the third, &c.

The QUARTAN, accompanied with *Symptoms* of other diſeaſes. Sp. I. var. 2.

Quartana cataleptica, *Sauv.* ſp. 7. *Bonet.* polyalth. vol. 1. p. 805. 158
Quartana comatoſa, *Sauv.* ſp. 15. *Werholf.* de febr. *C. Piſonis* Obſerv. de morbis a colluvia ſeroſ. obſ. 166, 167, 168, 169, 171, 172, 173, 174.
Quartana epileptica, *Sauv.* ſp. 8. *Scholzii* Conſ. 379, 380.
Quartana hyſterica, *Sauv.* ſp. 10. *Morton,* Pyret. exerc. 1. cap. ix. H. 10, 11.
Quartana nephralgica, *Sauv.* ſp. 9.
Quartana metaſtatica, *Sauv.* ſp. 17.
Quartana amens, *Sauv.* ſp. 12. *Sydenham* de morb. acut. cap. v.
Quartana ſplenetica, *Sauv.* ſp. 2. *Etmuller,* Coll. conſult. caſ. 25.

The QUARTAN *complicated* with other *Diſeaſes*. Sp. I. var. 3.

Quartana ſyphilitica, *Sauv.* ſp. 6. *Plateri,* obſerv. L. III. p. 676. Edin. Eſſ. art. xlvii. obſ. 8. 159
Quartana arthriticia, *Sauv.* ſp. 11. *Muſgr. de Arthr.* ſymp. cap. ix. H. 4. et 5.
Arthritis febriſequa, *Sauv.* ſp. 10.
Arthritis febricoſa, *Sauv.* ſp. 10. *Werlholf.* de febr. *Cockburn* de morbis navigantium, obſ. 19.
Quartana ſcorbutica, *Sauv.* ſp. 14. *Barthol.* de med. Dan. diſſ. iv. *Tim.* L. VIII. caſ. 18.

The *Remitting* QUARTAN. Sp. II.

Tetartophya. *Sauv.* gen. 85. *Sag.* 699. *Lin.* 21.
Quartana remittens auctorum. 150
Var. 1. Tetartophya ſimplex, *Sauv.* ſp. 1.
   2. Amphimerina ſemiquartana, *Sauv.* ſp. 23.
   3. Tetartophya ſemitertiana, *Sauv.* ſp. 5.
   4. Tetartophya maligna, *Sauv.* ſp. 6. *Lautter.* Hiſt. med. caſ. 21. *M. Donat.* L. III. cap. 14. ex. *M. Gatenaria Horſt.* L. I. obſ. 15.
   5. Tetartophya carotica, *Sauv.* ſp. 4. *Werlholf.* de febr. *Bianchi* Hiſt. hep. pars III. conſt. ann. 1718, p. 751.
   6. Tetartophya ſplenalgica, *Sauv.* ſp. 2.
   7. Tetartophya, hepatalgica, *Sauv.* 3. *Car. Piſ.* in prefat. p. 33.
   8. Amphimerina ſpaſmodica, *Sauv.* ſp. 16.

To the tertian or quartan fevers alſo belong the *Erraticæ* of authors. As all thoſe abovementioned differ only in the ſlight circumſtance of the type from the intermitting and remitting tertians already deſcribed at length, it is unneceſſary here to take up time in deſcribing every minute circumſtance related by phyſicians concerning them, eſpecially as it could contribute nothing towards the laying down a better method of cure than what hath been already ſuggeſted.

GENUS III. QUOTIDIANA; the QUOTIDIAN FEVER.

Quotidiana auctorum, *Sauv.* gen. 86. *Lin.* 15. *Vog.* I. *Hoffm.* II. 33. *Junck.* tab. 79.

161 The *Genuine* QUOTIDIAN. Sp. 1. var. 1. A.
Quotidiana ſimplex, *Sauv.* ſp. 1.
Quotidiana legitima, *Sennert.* de febr. cap. 18.

Deſcription. This kind of fever generally comes on about ſix or ſeven o'clock in the morning, beginning with a conſiderable degree of cold and ſhivering, which laſts for about an hour; and is often accompanied with vomiting, or ſpontaneous diarrhœa, or both. It is ſucceeded by a pretty ſtrong heat, accompanied with thirſt, reſtleſſneſs, and pain of the head. When the heat abates a little, a ſpontaneous ſweat commonly follows, and the whole paroxyſm rarely exceeds ſix hours. It returns, however, every day almoſt always at the ſame hour, unleſs it be evidently diſturbed.

Cauſes of, and perſons ſubject to, the diſeaſe. The ſame general cauſes are to be aſſigned for the quotidian as for other intermittents. This kind occurs but rarely; and is ſaid to attack people of a phlegmatic temperament rather than any other; alſo old people rather than young, and women rather than men.

The prognoſis and method of cure are not different from thoſe of tertians and quartans.

162 The *Partial* Quotidian. Sp. 1. var. 1. B.
Quotidiana partialis, *Sauv.* ſp. 16. *Cnoffel,* E. N. C. D. I. A. III. obſ. 205. Edin. Med. Eſſ. vol. 1. art. 31. vol. ii. art. 16.
Quotidiana cephalalgica, *Sauv.* ſp. 6. *Mort.* pyretol. exerc. i. hiſt. 27. *Van Swieten in Boerh.* p. 534.
Cephalalgia intermittens, *Sauv.* ſp. 7.
Cephalæa febricoſa, *Sauv.* ſp. 4.
Quotidiana ophthalmica, *Morton,* ibid. hiſt. 17. *Van Swieten,* ibid.
Ophthalmia febricoſa, *Sauv.* ſp. 23.

Theſe diſtempers attack only ſome particular part of the body, as the head, the eye, arm, &c. producing periodical affections of thoſe parts returning once in 24 hours; and are to be cured by the bark, as other intermittents. They are known to belong to this claſs, by the evident intermiſſion of the pain or other affection of the part. The *quotidiana hyſterica, Sauv.* ſp. 3. *quotidiana catarrhalis, Sauv.* ſp. 9, and *quotidiana ſtrangurioſa, Sauv.* ſp. 11. ſeem to be ſymptomatic diſorders.

113 The *Remitting* QUOTIDIAN. Sp. II.
Amphimerina, *Sauv.* gen. 84. *Lin.* 20.
Quotidiana continua, *Vog.* 15.
Quotidianæ remittentes et continuæ auctorum.
Amphimerina latica, *Sauv.* ſp. 1.
Febris continua, lymphatica, *Etmuller,* Coll. conf. caſ. 32. *River.* Obſ. cent. 1. obſ. 57.
Amphimerina ſingultuoſa, *Sauv.* ſp. 14.
Febris continua Lyngodes, *Vog.* 26.

Concerning theſe alſo nothing remains neceſſary to be mentioned in this place, having already ſo fully diſcuſſed the remitting fevers in all the different parts of the world. Many other varieties of theſe fevers mentioned by different authors are to be accounted merely ſymptomatic.

SECT. II. CONTINUED FEVERS.

Continuæ, *Sauv.* claſs ii. ord. 1. *Vog.* claſs I. ord. 2. *Sag.* 666. *Boerh.* 727.
Continentes, *Lin.* claſs. ii. ord. 1. *Stahl.* Caſ. mag. 35. Caſ. min. 87. *Junck.* 58. *Sennert.* de febr. L. ii. cap. 2. et 10.

GENUS IV. SYNOCHA.

Synocha, *Sauv.* gen. 80. *Lin.* 12. *Junck.* 58. 164
Synocha, ſive febris acuta ſanguinea, *Hoffm.* II. 105.
Synochus, *Vog.* 16.
Continua non putris, *Boerh.* 720.
Ephemera, *Sauv.* g. 79. *Boerh.* 728. *Junck.* 57.
Diaria, *Lin.* 11.
Febris inflammatoria auctorum.

Deſcription. The moſt ſimple kind of ſynocha is the ephemera or diary fever. It begins without any ſenſation of cold or ſhivering, unleſs there be ſome internal inflammation, or the ſmall-pox or meaſles happen to be preſent. A continual heat without any intermiſſion conſtitutes the eſſence of this diſeaſe. The heat, however, is more tolerable than in the ſynocha properly ſo called. In ſome the pains of the head are pungent and throbbing, anſwering to the pulſations of the arteries; but in others they are dull and heavy. The face is red and bloated; and there is a remarkable laſſitude of the limbs, with a ſtrong, full, and frequent pulſe. The urine is red, and depoſits a ſediment almoſt of the colour of orange-peel; and in the very firſt day of the diſeaſe, ſigns of concoction (according to the Hippocratic phraſe) appear. The fever commonly goes off with a gentle ſweat, but ſometimes, though more rarely, with an hemorrhagy of the noſe. Its ſhorteſt period is 24 hours; but if it goes beyond the fourth day, it is then a *ſynocha* properly ſo called.

The ſimple ſynocha, according to Vogel, begins with cold and ſhivering, ſucceeded by vehement heat, redneſs, and dryneſs of the ſkin. The face, eſpecially, is very red, and the thirſt intenſe. The head is either pained or heavy. The patient either doth not ſleep at all, or is diſturbed with dreams. A moiſt ſweat then breaks out all over the ſkin. The pulſe is full, quick, and frequent; the judgment is ſometimes a little diſturbed: young people are apt to be terrified with imaginations; and they for the moſt part incline to ſleep: the reſpiration is difficult, and the belly coſtive; at the ſame time that a tenſive kind of laſſitude is perceived over the whole body. A complete criſis takes place either on the fourth or at the fartheſt on the eleventh day. The characteriſtic marks of the ſimple ſynochus, therefore, are, A redneſs of the face, moiſture of the ſkin, a ſtrong and frequent pulſe.

Cauſes of, and perſons ſubject to, this diſeaſe. As we have already remarked of intermittents, ſo muſt we alſo now remark of continued fevers, that it is impoſſible to diſcover thoſe minute cauſes which occaſion the difference of type betwixt one inflammatory fever and another, though moſt authors pretend to enumerate theſe with great certainty. Thus Juncker tells us, that the cauſe of the ſimple ephemera is plethora, together with any immoderate agitation and commotion of the fluids while in that ſtate. Vogel reckons among the cauſes of his *febres diaria,* paſſions of the mind, pain, want, expoſure to the ſun &c.; a repulſion or abſorption of certain humours; wounds, fractures, luxations, &c.; ſo that in general we may reckon every thing tending to increaſe the action of the arterial ſyſtem to be in certain circuſtances a cauſe of inflammatory fever.—Hence we find thoſe are moſt ſubject to the ſynocha whoſe conſtitution is either naturally robuſt, or who are expoſed to thoſe cauſe which tend to produce an increaſed action of the arterial ſyſtem; ſuch as hard labour, high living, &c.

Prognoſis. The moſt ſimple kind of ſynocha, that is, the ephemera or diary fever, is commonly cured without the aſſiſtance of medicine, and therefore the prognoſis is for the moſt part favourable: yet, if it be improperly treated by heating medicines, it may eaſily be converted into the other kind; or, if there be a putrid diſpoſition of the fluids, into a fever of a very dangerous nature. The ſame thing is to be underſtood even of the moſt violent kind; for ſimple inflammatory fevers are not dangerous unleſs complicated with an affection of ſome particular part, as the pleura, ſtomach, &c.

Cure. Dr Cullen objects to the plan of thoſe who are for leaving the cure of continued fevers to the operations of nature; becauſe theſe operations are neither certain in themſelves, nor are they ſo well underſtood as to enable us to regulate them properly; and it is likewiſe poſſible to ſuperſede them by art. The plan therefore on which he proceeds is, to form his indications of cure upon the means of obviating the tendency to death in fevers; and theſe he reduces to three. 1. To moderate the violence of re-action.—2. To remove or obviate the cauſes of debility; and, 3. To obviate or correct the tendency of the fluids to putrefaction.

The *firſt* indication may be anſwered, 1. By all thoſe means which diminiſh the action of the heart and arteries. 2. By thoſe which take off the ſpaſm of the extreme veſſels, which, according to his theory, is the chief cauſe of violent re-action.

I. The action of the heart and arteries may be diminiſhed, 1. By avoiding or moderating thoſe irritations which, in one degree or other, are almoſt conſtantly applied to the body. 2. By the uſe of certain ſedative powers. 3. By diminiſhing the tenſion or tone of the arterial ſyſtem.

[1.] The irritations abovementioned are the impreſſions made upon our ſenſes, the exerciſe of the body and mind, and the taking in of aliments. The avoiding of theſe as much as poſſible, or the moderating their force, makes what is properly called the *antiphlogiſtic regimen*, proper to be employed in *almoſt* every continued fever. This regimen is to be directed in the following manner.

1. Impreſſions on the external ſenſes, as ſtimulant to the ſyſtem, and a chief ſupport of its activity, ſhould be avoided as much as poſſible; eſpecially ſuch as are of a ſtronger kind, and which give pain and uneaſineſs. No impreſſion is to be more carefully guarded againſt than that of external heat; and at the ſame time every other means of increaſing the heat of the body is to be ſhunned. Both theſe precautions are to be taken as ſoon as a hot ſtage is fully formed, and to be attended to during its continuance, except in certain caſes, where a determination to ſweating is neceſſary, or where the ſtimulant effects of heat may be compenſated by circumſtances which determine it to produce a relaxation and revulſion.

2. All motion of the body is to be avoided as much as poſſible, and that poſture only choſen which employs the feweſt muſcles, and keeps none of them long in a ſtate of contraction. Speaking, as it accelerates reſpiration, is particularly to be avoided. It muſt alſo be obſerved, that every motion of the body is more ſtimulant in proportion as the patient is weaker.

3. The exerciſe of the mind is alſo to be avoided, as being a ſtimulus to the body; but here an exception is to be made in the caſe of a delirium coming on, when the preſenting of accuſtomed objects may divert the irregular train of ideas then ariſing in the mind.

4. The preſcence of recent aliment in the ſtomach proves always a ſtimulus to the ſyſtem, and ought therefore to be as moderate as poſſible. A total abſtinence for ſome time may be of ſervice; but as this cannot be long continued with ſafety, we muſt avoid the ſtimulus of aliment by chooſing that kind which gives the leaſt. Alimentary matters are alſo to be accounted more ſtimulant in proportion to their alkaleſcent qualities; and this leads us to avoid all animal, and uſe only vegetable food. For the ſame reaſon, aromatic and ſpirituous liquors are to be avoided; and in anſwering the preſent indication, we muſt abſtain from all fermented liquors except thoſe of the loweſt quality. Other ſtimuli are, the ſenſation of thirſt, crudities or corrupted humours in the ſtomach, a preternatural retention of the fæces in the inteſtines, and a general acrimony of all the humours, which is in moſt fevers to be ſuſpected. Theſe are to be removed by ſuch methods as the urgency of the ſymptoms require, by diluting liquors, vomiting, the uſe of acids, laxative clyſters, and large quantities of antiſeptic drinks.

[2.] The ſecond method of moderating the violence of reaction is by the employment of certain ſedative powers, with a view to diminiſh the activity of the whole body, and particularly that of the ſanguiferous ſyſtem. The firſt of theſe to be mentioned is the application of cold. Heat is the chief ſupport of the activity of the animal-ſyſtem; and the ſyſtem is therefore provided with a power of generating heat in itſelf: but at the ſame time we may obſerve, that this would go to exceſs, were it not conſtantly moderated be a cooler temperature in the ſurrounding atmoſphere. When, therefore, the generating power of heat in the ſyſtem is increaſed, as is commonly the caſe in fevers, it is neceſſary not only to avoid all further means of increaſing it, but alſo to apply air of a cooler temperature; or at leaſt to apply it more entirely and freely than in a ſtate of health. This is ſhown, from ſome late obſervations, to be a very powerful means of moderating the violence of reaction; but what is the mode of its operation, to what circumſtances of fever it particularly applies, or what limitations it requires, are not yet fully aſcertained.

Another ſedative power very frequently employed in fevers, is that of certain medicines known in the materia medica by the name of *refrigerants*. The chief of theſe are acids of all kinds when ſufficiently diluted, and which are, in ſeveral reſpects, remedies adapted to continued fevers. Thoſe eſpecially in uſe are the vitriolic and vegetable; and on many accounts the latter are to be preferred. Another ſet of refrigerants are the neutral ſalts formed of the vitriolic, nitrous, or vegetable acids, with alkalies either fixed or volatile. All theſe neutrals, while they are diſſolved in water, generate cold: but as that cold ceaſes ſoon after the diſſolution is finiſhed, and as the ſalts are generally exhibited in a diſſolved ſtate, their refrigerant power in the animal body does not all depend upon their power of generating cold with water. Nitre is the refrigerant chiefly employed; but all the others, compounded as abovementioned, partake more or leſs of the ſame quality. Beſides theſe neutrals, ſome metallic ſalts have alſo been employed in fevers, particularly the ſugar of lead: but the refrigerant powers of this ſalt are by no means aſcertained, and its deleterious qualities are too well known to admit of its being freely uſed.

[3.] The third general method of diminiſhing the reaction of the ſyſtem, is by leſſening the tenſion, tone, and activity of the ſanguiferous ſyſtem. As the activity of the ſyſtem in a great meaſure depends upon the tone, and this again upon the tenſion, of the veſſels, given to them by the quantity of fluids they contain, it is evident, that the diminution of the quantity of theſe muſt diminiſh the activity of the ſanguiferous ſyſtem. The moſt efficacious means of diminiſhing the quantity of fluids is by the evacuations of blood-letting and purging. The former is evidently one of the moſt powerful means of diminiſhing the activity of the whole body, and eſpecially of the ſanguiferous ſyſtem; and it muſt therefore be the moſt effectual means of moderating the reaction in fevers. When the violence of reaction, and its conſtant attendant a phlogiſtic diatheſis, are ſufficiently evident; when theſe conſtitute the principal part of the diſeaſe, and may be expected to continue through the whole of it, as in the caſes of ſynocha; then blood-letting is the principal remedy, and may be employed as far as the ſymptoms of the diſeaſe may ſeem to require, and the conſtitution of the patient will bear. It muſt, however, be remarked, that a greater evacuation than is neceſſary may occaſion a ſlower recovery, and render the perſon more liable to a relapſe, or bring on other diſeaſes. It is alſo to be obſerved, that this evacuation is the more effectual, as the blood is more ſuddenly drawn off, and as the body is at the ſame time more free from all irritation, and therefore when it is in a poſture in which the feweſt muſcles are in action.

With regard to purging, when we conſider the quantity of fluids conſtantly preſent in the cavity of the inteſtines, and the quantity which may be drawn off from the innumerable excretories that open into this cavity, it will be obvious, that a very great evacuation may be made in this way; and if this be done by a ſtimulus that is not at the ſame time communicated to the reſt of the body, it may, by emptying both the cavity of the inteſtines and the arteries which furniſh the excretions poured into it, induce a conſiderable relaxation in the whole ſyſtem; and is therefore ſuited to moderate the violence of reaction in fevers. But it is to be obſerved, that as the fluid drawn from the excretories opening into the inteſtines is not all drawn immediately from the arteries, and as what is even more immediately drawn from theſe is drawn off ſlowly; ſo the evacuation will not, in proportion to its quantity, occaſion ſuch a ſudden depletion of the red veſſels as blood-letting does; and therefore cannot act ſo powerfully in taking off the phlogiſtic diatheſis of the ſyſtem.

At the ſame time the evacuation may induce a conſiderable degree of debility; and therefore, in thoſe caſes in which a dangerous ſtate of debility is likely to occur, purging is to be employed with a great deal of caution; and this caution is more difficult to be obſerved than in the caſe of blood-letting: and it is further to be noticed, that as purging takes off in ſome meaſure the determination of the blood to the veſſels on the ſurface of the body, it ſeems to be an evacuation not well adapted to the cure of fevers.

II. The other method of moderating the violence of reaction in fevers is by the exhibition of thoſe remedies ſuited to take off the ſpaſm of the extreme veſſels, ſuppoſed to be the irritation which chiefly ſupports the reaction. The means to be employed for this purpoſe are either internal or external.

Firſt, The internal means are, 1. Thoſe which determine the force of the circulation to the extreme veſſels, on the ſurface of the body, and, by reſtoring the tone and activity of theſe veſſels, overcome the ſpaſm on their extremities. 2. Thoſe medicines which have the power of taking off ſpaſm in any part of the ſyſtem, and which are known under the title of ANTISPASMODICS.

(1.) Thoſe remedies which are fit to determine to the ſurface of the body are, 1. Diluents. 2. Neutral ſalts. 3. Sudorifics. 4. Emetics.

1. Water enters, in a large proportion, into the compoſition of all the animal fluids, and a large quantity of it is always diffuſed through the whole of the common maſs. In a ſound ſtate, the fluidity of the whole maſs depends upon the quantity of water preſent in it. Water therefore is the proper diluent of our maſs of blood, and other fluids are diluent only in proportion to the quantity of water they contain.

In a healthy ſtate, alſo, the fulneſs of the extreme veſſels and the quantity of excretion are in proportion to the quantity of water preſent in the body. But in fever, though the excretions be in ſome meaſure interrupted, they continue in ſuch quantity as to exhale the more fluid parts of the blood; and, while a portion of them is at the ſame time neceſſarily retained in the larger veſſels, the ſmaller, and the extreme veſſels, both from the deficiency of fluid and their own contracted ſtate, are leſs filled, and therefore allowed to remain in that condition. To remedy this contracted ſtate, nothing is more neceſſary than a large ſupply of water or watery fluids taken in by drinking or otherwiſe; for as any ſuperfluous quantity of water is forced off by the ſeveral excretories, ſuch a force applied may be a means of dilating the extreme veſſels, and of overcoming the ſpaſm affecting the extremities. Accordingly, the throwing in of a large quantity of watery fluids has been, at all times, a remedy much employed in fevers; and in no inſtance more remarkably than by the Spaniſh and Italian phyſicians, in the uſe of what they call the *diæta aquea*. This practice conſiſts in taking away every other kind of aliment and drink, and in giving, in divided portions, every day for ſeveral days together, ſix or eight pounds of plain water, generally cold, but ſometimes warm. All this, however, is to be done only after the diſeaſe has continued for ſome time, and at leaſt for a week.

7. A ſecond means of determining to the ſurface of the body, is by the uſe of neutral ſalts. Theſe neutrals, in a certain doſe, taken into the ſtomach, produce ſoon after a ſenſe of heat upon the ſurface of the body; and, if the body be covered cloſe and kept warm, a ſweat is readily brought out. The ſame medicines taken during the cold ſtage of a fever, very often put an end to it, and bring on the hot one; and they are alſo remarkable for ſtopping the vomiting which ſo frequently attends the cold ſtage of fevers. All this ſhows, that neutral ſalts have a power of determining the blood to the ſurface of the body, and may therefore be of uſe in taking off the ſpaſm which ſubſiſts there in fevers. The neutral moſt commonly employed in fevers, is that formed of an alkali with the native acid of vegetables. But all the other neutrals have more or leſs of the ſame virtue; and perhaps ſome of them, particularly the ammoniacal ſalts, poſſeſs it in a ſtronger degree. As cold water taken into the ſtomach often ſhows the ſame diaphoretic effects with the neutral ſalts, it is probable that the effect of the latter depends upon their refrigerant powers.

3. A third method of determining to the ſurface of the body, and taking off the ſpaſm ſubſiſting there, is by the uſe of ſudorifics and of ſweating. The propriety of this remedy has been much diſputed; and many ſpecious arguments may be adduced both for and againſt the practice. In its favour may be urged, 1. That in healthy perſons, in every caſe of increaſed action of the heart and arteries, a ſweating takes place, and is, ſeemingly, the means of preventing the bad effects of ſuch increaſed action. 3. That, in fevers, their moſt uſual ſolution and termination is by ſpontaneous ſweating. 3. That, even when excited by art, is has been found uſeful at certain periods, and in certain ſpecies of fever.—On the other hand, it may be urged againſt the practice of ſweating, 1. That in fevers, as a ſpontaneous ſweating does not immediately come on, there are ſome circumſtances different from thoſe in the ſtate of health, and which may render it doubtful whether the ſweating can be ſafely excited by art. 2. That in many caſes the practice has been attended with bad conſequences. The means commonly employed have a tendency to produce an inflammatory diatheſis; which, if not taken off by the ſweat ſucceeding, muſt be increaſed with much danger. Thus ſweating employed to prevent the acceſſions of intermitting fevers has often changed them into a continued form, which is always dangerous. 3. The utility of the practice is doubtful, as ſweating, when it happens, does not always give a final determination, as muſt be manifeſt in the caſe of intermittents, and in many continued fevers which are ſometimes in the beginning attended with ſweatings which do not prove final; and, on the contrary, whether they be ſpontaneous or excited by art, they ſeem often to aggravate the diſeaſe.

From theſe conſiderations, it is doubtful if the practice of ſweating can be admitted very generally; but, at the ſame time, it is alſo very doubtful if the failure of the practice, or the miſchiefs ſaid to ariſe from it, have not been owing to the improper conduct of the practitioner. With reſpect to the laſt, it is almoſt agreed among phyſicians, 1. That ſweating has been generally hurtful when excited by ſtimulant, heating, and inflammatory medicines. 2. That it has been hurtful when excited by much external heat, and continued with a great increaſe of the heat of the body. 3. That it is always hurtful when it does not relieve; and rather increaſes the frequency and hardneſs of the pulſe, the anxiety and difficulty of breathing, the head-ach, and delirium. 4. That it is always hurtful if it be urged when the ſweat is not fluid, and when it is partial and on the ſuperior parts of the body only.

In theſe caſes, it is probable, that either an inflammatory diatheſis is produced, which increaſes the ſpaſm on the extreme veſſels; or that, from other cauſes, the ſpaſm is too much fixed to yield eaſily to the increaſed action of the heart and arteries; and upon either ſuppoſition it muſt be obvious, that urging the ſweat may produce determinations to ſome of the internal parts, with very great danger.

Notwithſtanding theſe doubts, however, it ſtill remains true, 1. That ſweating has been often uſeful in preventing the acceſſions of fevers when they have been certainly foreſeen, and a proper conduct employed. 2. That even after fevers have in ſome meaſure come on, ſweating has interrupted their progreſs when properly employed, either at the very beginning of the diſeaſe, or during its approach and gradual formation. 3. That even after pyrexiæ have continued for ſome time, ſweating has been ſucceſsfully employed in curing them, as is particularly exemplified in the caſe of a rheumatiſm. 4. That certain fevers produced by a very powerful ſedative contagion, have been generally treated moſt ſucceſsfully by ſweating.

Theſe inſtances are in favour of ſweating, but give no general rule; and it muſt be left to farther experience to determine how far any general rule can be eſtabliſhed in this matter. In the mean time, if the practice of ſweating is to be attempted, the following rules may be laid down for the conduct of it. 1. That a ſweat ſhould be excited without the uſe of ſtimulant inflammatory medicines. 2. That it ſhould be excited with as little external heat, and with as little increaſe of the heat of the body as poſſible. 3. That, when excited, it ſhould be continued for a due length of time; not leſs than 12 hours, and ſometimes for 24 or 48 hours; always, however, ſuppoſing that it proceeds without the dangerous circumſtances already mentioned. 4. That for ſome part of the time, and as long as the perſon can eaſily bear, it ſhould be carried on without admitting of ſleep. 5. That it ſhould be rendered univerſal over the whole body; and therefore particularly that care ſhould be taken to bring the ſweating to the lower extremities. 6. That the practice ſhould be rendered ſafer by moderate purging excited at the ſame time. 7. That it ſhould not be ſuddenly checked by cold any how applied to the body.

When attention is to be given to theſe rules, the ſweating may be excited, 1. By warm bathing, or a fomentation of the lower extremities. 2. By frequent draughts of tepid liquors, chiefly water, rendered more grateful by the addition of a light aromatic, or more powerful by that of a ſmall quantity of wine. 3. By giving ſome doſes of neutral ſalts. 4. Moſt effectually, and perhaps moſt ſafely, by a large doſe of an opiate, joined with a portion of neutral ſalts, and of an emetic.

The fourth mean of determining to the ſurface of the body, and thereby taking off the ſpaſm affecting the extreme veſſels, is by the uſe of emetics. Theſe, particularly of the antimonial kind, have been employed in the cure of fevers ever ſince the introduction of chemical medicines; and though of late their uſe has become very general, their efficacy is ſtill diſputed, and their manner of operating is differently explained.

Vomiting is in many reſpects uſeful in fevers; as it evacuates the contents of the ſtomach, as it emulges the biliary and pancreatic ducts, and evacuates the contents of the duodenum, and perhaps alſo of a larger portion of the inteſtines; as it agitates the whole of the abdominal viſcera, it expedes the circulation in them, and promotes their ſeveral ſecretions; and laſtly, as it agitates alſo the viſcera of the thorax, it has like effects there.

It is not to this cauſe, however, that we are to impute the effect vomiting has in determining to the ſurface of the body. This muſt be attributed to the particular operation of emetics upon the muſcular fibres of the ſtomach, whereby they excite the action of the extreme arteries on the ſurface of the body, and by this means effectually determine the blood to theſe veſſels, remove the atony, and take off the ſpaſm affecting them. For this purpoſe they are exhibited in two different ways; that is, either in ſuch doſes as may excite full and repeated vomitings, or in ſuch doſes as may excite ſickneſs and nauſea only, with little or no vomiting at all.

Full vomiting is well ſuited to determine to the ſurface of the body, and therefore to obviate the atony and ſpaſm which lay the foundation of fever. Thus, vomiting excited a little before the expected acceſſion of the paroxyſm of an intermittent, has been found to prevent the paroxyſm altogether. It has been obſerved alſo, that when contagion has been applied to a perſon, and firſt diſcovers its operation, a vomit given has prevented the fever which might otherwiſe have been expected.

Theſe are the advantages to be obtained by exciting vomiting at the firſt approach of fevers, or of the paroxyſm of fevers; and they may alſo be applied after fevers are formed, to take off, perhaps entirely, the atony and ſpaſm, or at leaſt to moderate theſe, ſo that the fever may proceed more gently and ſafely. It is ſeldom, however, that vomiting is found to produce a final ſolution of fevers; and after they are once formed, it is commonly neceſſary to repeat the vomiting ſeveral times; but this is attended with inconveniency, and ſometimes with diſadvantage. The operation of full vomiting is tranſitory, and the exerciſe of vomiting is a debilitating power; and therefore, when the vomiting does not remove the atony and ſpaſm very entirely, it may give occaſion to their recurrence with greater force. For theſe reaſons, after fevers are fully formed, ſome phyſicians have thought proper to employ emetics in nauſeating doſes only. Theſe are capable of exciting the action of the extreme veſſels, and their operation is more permanent. At the ſame time they often ſhow their power by exciting ſome degree of ſweat, and their operation is rendered more ſafe by their commonly producing ſome evacuation by ſtool. But nauſea continued for any great length of time, is to moſt patients a ſenſation highly diſtreſſing, and almoſt inſufferable.

The emetics chiefly in uſe at preſent are, ipecacuanha and antimony. The former may be employed for determining to the ſurface of the body: but, even in very ſmall doſes, it ſo readily excites vomiting, that it is with difficulty employed for the purpoſe of nauſeating only; and in whatever manner employed, there is reaſon to ſuſpect that its effects are leſs permanent, and leſs powerfully communicated from the ſtomach to the reſt of the ſyſtem, than thoſe of antimony. This laſt is therefore generally preferred; and its preparations, ſeemingly various, may all be reduced to two heads; one comprehending thoſe in which the reguline part is in a condition to be acted upon by acids, and therefore on meeting with acids in the ſtomach it becomes active; and another, comprehending thoſe preparations in which the reguline part is already joined with an acid, rendering it active. Of each kind there are great numbers, but not differing eſſentially from one another; the two moſt worthy of notice are, the *calx nitrata antimonii* and *emetic tartar* or *antimonium tartariſatum*, of the Edinburgh diſpenſatory. Both theſe are very efficacious medicines; but the latter ſeems preferable, becauſe its doſe is capable of being better aſcertained; though the former, on account of its ſlower operation, may have ſome advantages, and in certain caſes be more efficacious as a purgative and ſudorific.

The *calx nitrata antimonii*, when firſt introduced into the pharmacopœia of the Edinburgh college, was ſuppoſed to be very nearly, if not preciſely, the ſame with a medicine which has of late been highly celebrated in the cure of fevers, Dr James's powder. But from later and more accurate obſervations, there is now reaſon to believe that the pulvis antimonialis of the London pharmacopœia, formed by the calcination of antimony with hartſhorn, approaches more nearly to that celebrated arcanum. But at any rate, the calx antimonii nitrata, the pulvis antimonialis, and James's powder, are probably not eſſentially different from each other. The two latter, however, have the moſt near reſemblance; and accordingly the Edinburgh college in the laſt edition of their pharmacopœia have introduced an article under the title of *antimonium calcareo-phoſphoratum*, which they conſider as ſo much ſimilar to James's powder, that they have uſed as a ſynonyme for it, the title of *pulvis Jacobi.*

The time moſt proper for exhibiting theſe medicines is a little before the acceſſion, when that can be certainly known. In continued fevers the exacerbations are not always very obſervable; but there is reaſon to believe, that one commonly happens about noon or ſoon after it; and that theſe, therefore, are the moſt proper times for exhibiting emetics.

With reſpect to the manner of adminiſtration, that of the *calx nitrata* is ſimple, as the whole of what is thought a proper doſe may be given at once; and no more can be properly given till the next acceſſion. The adminiſtration of the emetic tartar is different. It is to be given in ſmall doſes, not ſufficient to excite vomiting,

miting; and theſe doſes are to be repeated after ſhort intervals for ſeveral times, till ſickneſs, nauſea, and ſome, though not much, vomiting come on. The difference of adminiſtration muſt depend upon the doſe, and the length of the interval at which it is given. If it be intended that the medicine ſhould certainly operate by ſtool, the doſes are made ſmall, and the intervals long. On the contrary, when vomiting is proper, or when much purging ought to be avoided, and therefore ſome vomiting muſt be admitted, the doſes are made larger, and the intervals ſhorter. With reſpect to both kinds of preparations, the repetition is to be made at the times of acceſſion, but not very often: for if the firſt exhibitions, duly managed, have little effect, it is ſeldom that the after exhibitions have much; and it ſometimes happens that the repeated vomiting, and eſpecially repeated purging, does harm by weakening the patient.

(2.) The other ſet of internal medicines which are ſuppoſed uſeful in taking off the ſpaſm of the extreme veſſels, are thoſe named *antiſpaſmodic*, But whatever may be the virtues of ſome of them in this way, ſuch is their power of ſtimulating at the ſame time, that very few of them can with ſafety be adminiſtered in fevers of an inflammatory nature. Almoſt the only one which can with ſafety be exhibited in theſe caſes is camphor; and the operations of this are by no means well aſcertained. Dr Huxham mentions it as a corrector of the acrimony of cantharides; and aſſures us, that it very effectually promotes a diaphoreſis. But from the remarks of other practioners, we have no juſt reaſon to ſuppoſe that it acts perceptibly in a doſe of five or ſix grains, though in 15 or 20 it produces a particular kind of intoxication:

Secondly. The external means ſuited to take off the ſpaſm of the extreme veſſels, are bliſtering and warm bathing.

1. What are the effects of bliſtering ſo frequently employed in fevers, is not yet agreed upon among phyſicians. Dr Cullen is of opinion, that the ſmall quantity of cantharides abſorbed from a bliſtering plaſter, is not ſufficient to change the conſiſtence of the maſs of blood; and therefore, that ſuch a quantity can neither do good by reſolving phlogiſtic lentor if it exiſts, nor do harm by increaſing the diſſolution of the blood ariſing from a putrid tendency in it. The effects of cantharides upon the fluids, therefore may be entirely, neglected. The inflammation produced by the application of cantharides to the ſkin, affords a certain proof of their ſtimulant power: but in many perſons the effect of that ſtimulus is not conſiderable; in many it is not communicated to the whole ſyſtem; and even when it does take place in the whole ſyſtem, it ſeems to be taken off very entirely by the effuſion and evacuation of ſerum from the bliſtered part. It may be concluded, therefore, that neither much good is to be expected nor much harm to be apprehended, from the ſtimulant power of bliſtering; and the certainty of this concluſion is eſtabliſhed by the great benefit ariſing from the proper practice of bliſtering in inflammatory diſeaſes. Much has been imputed to the evacuation made by bliſtering; but it is never ſo conſiderable as to affect the whole ſyſtem; and therefore can neither by a ſudden depletion relax the ſanguiferous ſyſtem, nor by any revulſion affect the general diſtribution of the fluids. The evacuation, however, is ſo conſiderable as to affect the neighbouring veſſels; and the manifeſt utility of bliſtering near the part affected in inflammatory diſeaſes leads us to think, that bliſtering, by deriving to the ſkin, and producing and effuſion there, relaxes the ſpaſm of the deeper ſeated veſſels. It is in this manner, moſt probably, that the tumor of a joint, from an effuſion into the cellular texture under the ſkin, takes off the rheumatic pain formerly affecting that joint. Analogous to this, probably, is the good effect of bliſtering in continued fevers; and ariſes from the relaxation of the ſpaſm of the extreme veſſels by a communication of the bliſtered part with the reſt of the ſkin. A bliſter may be employed at any period in continued fevers; but it will be of moſt advantage in the advanced ſtate of ſuch fevers, when, the reaction being weaker, all ambiguity from the ſtimulating power of bliſtering is removed, and when it may beſt concur with other circumſtances tending to a final ſolution of the ſpaſm.

From this view of the matter, it will appear, that the part of the body to which bliſters ought to be applied is indifferent, except upon the ſuſpicion of topical affection, when the bliſtering is to be made as near as poſſible to the part affected. Whether ſinapiſms and other *rubefacientia* act in a manner analogous to what has been ſuppoſed of bliſtering may be doubtful; but their effects in rheumatiſm and other inflammatory diſeaſes render it probable.

2. The other external means of taking off the ſpaſm of the extreme veſſels is warm bathing. This was frequently, and in different circumſtances, employed by the ancients; but has, till very lately, been neglected by modern phyſicians. As the heat of the bath ſtimulates the extreme veſſels, and, with the concurrence of moiſture, alſo relaxes them, it ſeems to be a ſafe ſtimulus, and well ſuited to take off the ſpaſm affecting theſe veſſels. It may be applied to the whole body by immerſion; but this is in many reſpects inconvenient; but whether ſome of the inconveniences of immerſion might not be avoided by a vapour-bath, is not yet determined by experience; but from extenſive experience it appears, that moſt of the purpoſes of warm bathing can be obtained by a fomentation of the legs and feet, if properly adminiſtered, and continued for a due length of time, not leſs than an hour. The marks of the good effect of ſuch a fomentation are, the patient's bearing it eaſily, its relieving delirium, and inducing ſleep.

GENUS V. TYPHUS; the *Typhus FEVER*.

Typhus, *Sauv.* Gen. 82. *Sag.* 677.

I. Typhus mitior, or the *Slow Nervous FEVER*. Sp. I. var. 1.

Febris maligna hectica convulſiva, ſive lues νευρωδης, *Willis*, de morb. convulſiva. cap. 8.

Febris peſtilens, *Fracaſtor*. de morb. contag. L. II. cap. 4.

Febris peſtilens ſine charactere veneni, *Foreſt*, L. VI. obſ. 26.

Febris hectica peſtilens, *Foreſt*, L. VI. obſ. 32.

Febris nova ann. 1685, *Sydenham*, Sched. monitor.

Febris putrida nervoſa, *Wintringh*. Com. Noſolog. ad ann. 1720, 1721.

Febris lenta nervoſa, *Huxham* on fevers, chap. 8.
Febris contagioſa, *Lind* on fevers and infection, *paſſim*.
Typhus nervoſus, *Sauv.* ſp. 2.
Typhus comatoſus, *Sauv.* ſp. 3.
Tritæophya typhodes Mangeti, *Sauv.* ſp. 11. *Raym. Fort.* de febribus.

Deſcription. Of all the deſcriptions we have of the nervous fever, that of Dr Huxham is perhaps the beſt. According to him, the patient at firſt grows ſomewhat liſtleſs, and feels ſlight chills and ſhudders, with uncertain fluſhes of heat, and a kind of wearineſs all over, like what is felt after great fatigue. This is always attended with a ſort of heavineſs and dejection of ſpirit, and more or leſs of a load, pain, or giddineſs of the head; a nauſea and diſreliſh of every thing ſoon follows, without any conſiderable thirſt, but frequently with urging to vomit, though little but inſipid phlegm is brought up. Though a kind of lucid interval of ſeveral hours ſometimes intervenes, yet the ſymptoms return with aggravation, eſpecially towards night; the head grows more giddy or heavy; the heat greater: the pulſe quicker, but weak; with an oppreſſive kind of breathing. A great torpor, or obtuſe pain and coldneſs, affects the hinder-part of the head frequently, and oftentimes a heavy pain is felt on the top all along the *coronary ſuture;* this, and that of the back-part of the head, generally attend nervous fevers, and are commonly ſucceeded by ſome degree of a delirium. In this condition the patient often continues for five or ſix days, with a heavy, pale, ſunk countenance; ſeemingly not very ſick, and yet far from being well; reſtleſs, anxious, and commonly quite void of ſleep, though ſometimes very drowſy and heavy; but although he appears to thoſe about him actually to ſleep, he is utterly inſenſible of it, and denies that he doth ſo. The pulſe during all this time is quick, weak, and unequal; ſometimes fluttering, and ſometimes for a few moments ſlow; nay, even intermitting, and then, with a ſudden fluſh in the face, immediately very quick, and perhaps ſoon after ſurpriſingly calm and equal; and thus alternately. The heats and chills are as uncertain and unequal; ſometimes a ſudden colour and glow ariſe in the cheeks, while the tip of the noſe and ear is cold, and the forehead at the ſame time in a cold dewy ſweat. Nay, it is very common, that a high colour and heat appear in the face, when the extremities are quite cold. The urine is commonly pale, and often limpid; frequently of a whey colour, or like vapid ſmall-beer, in which there is either no manner of ſediment, or a kind of looſe matter like bran irregularly ſcattered up and down in it. The tongue at the beginning is ſeldom or never dry or diſcoloured, but ſometimes covered with a thin whitiſh mucus: at length, indeed, it often appears very dry, red, and chapped, or of the colour of pomegranate-rind; but this moſtly at the cloſe of the diſeaſe: yet, however dry the tongue and lips ſeem, the patient ſcarce ever complains of thirſt, though ſometimes of a heat in the tongue. About the ſeventh or eighth day, the giddineſs, pain, or heavineſs of the head become much greater, with a conſtant noiſe in it, or *tinnitus aurium;* which is very diſturbing to the ſick, and frequently brings on a delirium. The load on the præcordia, anxiety and faintneſs, grow much more urgent; and they often fall into an actual deliquium, eſpecially if they attempt to ſit up; cold ſweats ſuddenly come out on the forehead, and on the backs of the hands (though at the ſame time there is too much heat in the cheeks and palms), and as ſuddenly go off. If the urine now grows more pale and limpid, a delirium is certainly to be expected, with univerſal tremors and *ſubſultus tendinum;* the delirium is ſeldom violent, but as it were a confuſion of thought and action, muttering continually to themſelves, and faltering in their ſpeech. Sometimes they awake only in a hurry and confuſion, and preſently recollect themſelves, but forthwith fall into a muttering dozy ſtate again. The tongue grows often very dry at the height, eſpecially in its middle part, with a yellowiſh liſt on each ſide, and trembles greatly when the ſick attempts to put it out. Frequently profuſe ſweats pour forth all at once, about the ninth, tenth, or twelfth day, commonly coldiſh and clammy on the extremities; oftentimes very thin ſtools are diſcharged, and then nature ſinks apace; the extremities grow cold, the nails pale or livid; the pulſe may be ſaid to tremble and flutter, rather than to beat, the vibrations being ſo exceeding weak and quick that they can ſcarce be diſtinguiſhed; though ſometimes they creep on ſurpriſingly ſlow, and very frequently intermit. The ſick become quite inſenſible and ſtupid, ſcarce affected with the loudeſt noiſe or the ſtrongeſt light; though, at the beginning, ſtrangely ſuſceptible of the impreſſions of either. The delirium now ends in a profound coma, and that ſoon in eternal ſleep. The ſtools, urine, and tears, run off involuntarily, and denounce a ſpeedy diſſolution, as the vaſt tremblings and twitchings of the nerves and tendons are preludes to a general convulſion, which at once ſnaps off the thread of life. In one or other of theſe ways are the ſick carried off, after having languiſhed for 14, 18, or 20 days; nay, ſometimes much longer. Moſt patients grow deaf and ſtupid towards the end of this diſeaſe, (ſome extremely deaf), though too quick and apprehenſive at the beginning; inſomuch that the leaſt noiſe or light greatly offended them. Many from their immoderate fears ſeem to hurry themſelves out of life, where little danger is apparent at the beginning: nay, ſome will not allow themſelves to ſleep, from a vain fear of dozing quite away; and others from the vaſt hurry, anxiety, and confuſion they are ſenſible of either during ſleep or at their waking.

Cauſes of, and perſons ſubject to, the diſorder. The nervous fever is moſt frequently the conſequence of contagion. It moſt commonly attacks perſons of weak nerves, a lax habit of body, and a poor thin blood; thoſe who have ſuffered great evacutions, a long dejection of ſpirits, immoderate watchings, ſtudies, fatigue, &c.; alſo thoſe who have uſed much crude unwholeſome food, vapid impure drinks, or who have been confined long in damp foul air; who have broken the vigour of their conſtitutions by ſalivations, too frequent purging, immoderate venery, &c. Hence we ſee how the diſeaſe is connected with an extreme debility of the nervous ſyſtem; for, when people are prepared for this fever by having their nerves already weakened, the contagious particles immediately attack the nervous ſyſtem, without

out ſo much affecting the ſtate of the blood or juices, though the latter are greatly affected in the putrid malignant fevers.

Prognoſis. In nervous fevers, the prognoſis is very much the ſame as that with the putrid malignant kind. And although death be not ſo frequent as in that modification of fever, yet it may juſtly be conſidered as a very fatal diſeaſe.

Cure. As this fever is produced by a contagion affecting the nervous ſyſtem of a perſon already debilitated, and thus producing weakneſs in an extreme degree, we have now occaſion to conſider Dr Cullen's *two indications* of cure omitted under the *Synocha;* namely, to remove the cauſe and obviate the effects of debility, and to correct the putreſcent tendency of the fluids; for though, in the beginning of nervous fevers, the tendency to putrefaction be not remarkable, it becomes exceedingly great towards their concluſion.

[1.] In anſwering the firſt indication, Dr Cullen obſerves, that moſt of the ſedative powers inducing debility ceaſe to act ſoon after they have been applied; and therefore the removing of them is not an object of the preſent indication. There is only one which may be ſuppoſed to continue to act for a long time, and that is the contagion applied; but we know nothing in the nature of contagion that can lead us to any meaſures for removing or correcting it. We know only its effects as a ſedative power inducing debility, or as a ferment inducing a tendency to putrefaction in the fluids, the former of which at preſent falls under our conſideration.—The debility induced in fevers by contagion, or other cauſes, appears eſpecially in the weaker energy of the brain; but in what this conſiſts, or how it may be reſtored, we do not well know; but as nature, ſeemingly for this purpoſe, excites the motion of the heart and arteries, we muſt aſcribe the continuance of the debility to the weaker re-action of the ſanguiferous ſyſtem: the means, therefore, which we employ for obviating debility, are immediately directed to ſupport and increaſe the action of the heart and arteries; and the remedies employed are tonics or ſtimulants.

In contagious diſeaſes we know, both from the effects which appear, and from diſſections, that the tone of the heart and arteries is conſiderably diminiſhed; and that tonic remedies are therefore properly indicated. We are to conſider theſe remedies as of two kinds; 1. The power of cold; 2. That of tonic medicines.

The power of cold as a tonic in fevers may be employed in two ways: either as thrown into the ſtomach, or as applied to the ſurface of the body. As we have already obſerved that the power of cold may be communicated from any one part to every other part of the ſyſtem, ſo it will be readily allowed that the ſtomach is a part as fit as any other for this communication, and that cold drink taken into the ſtomach may prove an uſeful tonic in fevers. This the experience of all ages has confirmed; but at the ſame time it has been frequently obſerved, that, in certain circumſtances, cold drink taken into the ſtomach has proved very hurtful; and therefore that its uſe in fevers requires ſome limitations. What theſe limitations ſhould be, and what are all the circumſtances which may forbid the uſe of cold drink, it is difficult to determine; but it ſeems clearly forbidden in all caſes where a phlogiſtic diatheſis prevails in the ſyſtem, and more eſpecially when there are topical affections of an inflammatory nature.

The other method of employing cold as a tonic, is by applying it to the ſurface of the body, as a refrigerant power fit to moderate the violence of reaction; but probably it may here alſo be conſidered properly as a tonic, and uſeful in caſes of debility.—Not only cool air, but cold water alſo may be applied to the ſurface of the body as a tonic. The ancients frequently applied it with advantage to particular parts as a tonic; but it is a diſcovery of modern times, that, in the caſe of putrid fevers attended with much debility, the body may be waſhed all over with cold water. This was firſt practiſed at Breſlaw in Sileſia, as appears from a diſſertation under the title of *Epidemia Verna, quæ Wratiſlaviam anno* 1737 *afflixit*, to be found in the *Acta Nat. Curioſ.* vol. x. And from other writers it appears, that the practice has paſſed into ſome of the neighbouring countries; but in Britain it does not appear that they have yet had any experience of it.

The medicines which have been employed in fevers as tonics are various. If the *ſaccharum ſaturni* hath been found uſeful, it is probably as a tonic rather than as a refrigerant; and the *ens veneris*, or other preparations of iron which have been employed, can act as tonics only. The preparations of copper, from their effects in epilepſy, are preſumed to poſſeſs a tonic power; but whether their uſe in fevers be founded on their tonic or emetic powers, is uncertain. And upon the whole there may no doubt occur ſome inſtances of fevers being cured by tonics taken from the foſſile kingdom; but the vegetable tonics are the moſt efficacious, and among theſe the Peruvian bark certainly holds the firſt place.

The bark has commonly been conſidered as a ſpecific, or a remedy of which the operation was not underſtood. We muſt obſerve, however, that, as in many caſes the effects of the bark are perceived ſoon after its being taken into the ſtomach, and before it can poſſibly be conveyed to the maſs of blood, we may conclude, that its effects do not ariſe from its operating on the fluids; and muſt therefore depend upon its operating on the nerves of the ſtomach, and being thereby communicated to the reſt of the nervous ſyſtem. This operation ſeems to be a tonic power, the bark being a remedy in many caſes of debility, particularly in gangrene: and if its operation may be explained from its poſſeſſing a tonic power, we may eaſily perceive why it is improper when a phlogiſtic diatheſis prevails; and from the ſame view we can aſcertain in what caſes of continued fever it may be admitted. Theſe caſes are either where conſiderable remiſſions have appeared, when it may be employed to prevent the return of exacerbations, on the ſame footing as it is uſed in intermitting fevers; or in the advanced ſtate of fevers, when all ſuſpicion of an inflammatory ſtate is removed, and a general debility prevails in the ſyſtem; and its being then employed is ſufficiently agreeable to the preſent practice.

Another ſet of medicines to be employed for obviating debility and its effects, are the direct ſtimulants.

lants. Theſe, in ſome meaſure, increaſe the tone of the moving fibres; but are different from the tonics, as they more directly excite and increaſe the action of the heart and arteries. This mode of their operation renders their uſe ambiguous; and when an inflammatory diatheſis is preſent, the effects of the ſtimulants may be very hurtful; but it is ſtill probable, that in the advanced ſtate of theſe fevers, when debility prevails, they may be uſeful.

Of all the ſtimulants which may be properly employed, wine ſeems to be the moſt eligible. It has the advantage of being grateful to the palate and ſtomach, and of having its ſtimulant parts ſo much diluted, that it can be conveniently given in ſmall doſes; and therefore it may be employed with ſufficient caution; but it is of little ſervice unleſs taken pretty largely.—It may be ſuſpected that wine has an operation analogous to that of opium; and on good grounds. But we can diſtinctly remark its ſtimulant power only; which renders its effects in the phrenitic delirium manifeſtly hurtful; and in the mild delirium depending on debility, as remarkably uſeful.

[2.] We muſt now proceed to the other indication of cure, namely to correct or obviate the tendency in the fluids to putrefaction. This may be done, 1. By avoiding any new application of putrid or putreſcent matter. 2. By evacuating the putrid or putreſcent matter already preſent in the body. 3. By correcting the putrid or putreſcent matter remaining in the body by diluents and antiſeptics. 4. By ſupporting the tone of the veſſels, and thereby reſiſting further putrefaction, or obviating its effects. 5. By moderating the violence of re-action, conſidered as a means of increaſing putrefaction.

The further application of putrid or putreſcent matter may be avoided, 1. By removing the patient from places filled with corrupted air. 2. By preventing the accumulation of the patients own effluvia, by a conſtant ventilation, and by a frequent change of bed-clothes and body-linen. 3. By the careful and ſpeedy removal of all excremental matters from the patient's chamber. 4. By avoiding animal-food.

The putrid or putreſcent matter already preſent in the body, may be evacuated partly by frequent evacuations of the contents of the inteſtines; and more effectually ſtill by ſupporting the excretions of perſpiration and urine by the plentiful uſe of diluents. That which remains in the body may be rendered more mild and innocent by the uſe of diluents, or may be corrected by the uſe of antiſceptics. Theſe laſt are of many and various kinds; but which of them are conveniently applicable, or more particularly ſuited to the caſe of fevers, is not well aſcertained. Thoſe moſt certainly applicable and uſeful are aceſcent aliments, acids of all kinds, and neutral ſalts.

The progreſs of putrefaction may be conſiderably retarded, and its effects obviated, by ſupporting the tone of the veſſels; and this may be done by tonic medicines, of which the chief are cold, and the Peruvian bark, as already mentioned. The violence of re-action increaſing the tendency to putrefaction, may be moderated by the means already mentioned under *ſynocha*.

Theſe are the proper indications to be obſerved in the cure of the ſlow nervous fever. Dr Huxham obſerves, that evacuations (eſpecially bleeding) are improper even at the beginning. Even a common purgative given at this time hath been followed by ſurpriſing languors, ſyncope, and a train of other ill ſymptoms. However, it may ſometime be neceſſary to cleanſe the ſtomach and primæ viæ by a gentle emetic, or a mild laxative. Indeed where nauſea, ſickneſs, and load at ſtomach are urgent, as is frequently the caſe in the beginning of this fever, a vomit is neceſſary. Clyſters of milk, ſugar, and ſalt, may be injected with ſafety and advantage every ſecond or third day, if nature wants to be prompted to ſtool. The temperate, cordial, diaphoretic medicines, are certainly, according to our author, moſt proper in theſe fevers; and a well-regulated, ſupporting, diluting diet, is neceſſary. The latter of itſelf, judiciouſly managed, will go a great way in the cure, eſpecially aſſiſted by well-timed and well-applied bliſters, and a due care to keep the patient as quiet as poſſible both in body and mind. But it ſhould be noted, that any ſtrong opiates are commonly very pernicious, however, much the want of ſleep and reſtleſſneſs may ſeem to demand them. Mild diaphoretics, ſuch as neutral draughts or elixir paregoricum, have much better effects; which, by raiſing a gentle eaſy ſweat, or at leaſt a plentiful perſpiration, calm the hurry of the ſpirits, and a refreſhing ſleep enſues. Where the confuſion and dejection of ſpirits are very conſiderable, bliſters have been adviſed to be applied to the neck, occiput, or behind the ears; and during all this a free uſe of thin wine-whey, ſome pleaſant ptiſan or gruel, with a little ſoft wine, muſt be indulged. Indeed the patients, in this caſe, ſhould drink frequently; though ſuch quantities may not be neceſſary as in the ardent, or even putrid malignant fevers; yet they ſhould be ſufficient to carry on the work of dilution, ſupport the ſweats, and ſupply the blood with freſh and wholeſome fluids, in place of that noxious matter which is continually paſſing off. In this view alſo a thin chicken-broth is of ſervice, both as food and phyſic, eſpecially towards the decline of the diſeaſe; and for the ſame reaſon thin jellies of hartſhorn, ſago, panada, are uſeful, adding a little wine to them, and the juice of Seville orange or lemon.

It is obſervable, that the ſick are never ſo eaſy as when they are in a gentle ſweat; for this ſoon removes the hurry of ſpirits, exacerbations of heat, &c. But profuſe ſweats ſhould never be encouraged, much leſs attempted, by very ſtrong heating medicines, eſpecially in the beginning or advance of the fever; for they too much exhauſt the vital power, and are followed by a vaſt dejection of ſpirits, tremors, ſtartings of the tendons, and ſometimes end in rigors, cold clammy ſweats, ſyncope, or a comatoſe diſpoſition. Sometimes irregular partial heats and fluſhes ſucceed, with great anxiety, reſtleſſneſs, delirium, difficulty of breathing, and a vaſt load and oppreſſion in the præcordia, ſo as to incline the leſs cautious obſerver to think there may be ſomething peripneumonic in it; but even here we muſt beware of bleeding, as the pulſe will be found very ſmall and unequal, though very quick. Nor is bleeding contra-indicated only by the weakneſs and fluttering of the pulſe, but alſo by the pale, limpid, and watery urine which is commonly attendant. Theſe ſymptoms denote the load, anxiety, and oppreſſion on the præcordia to proceed from an affection of the nervous ſyſtem, and not from a peripneumonic obſtruction or inflammation. The breathing in this caſe, though thick and laborious, is not hot, but a kind of ſighing or ſobbing reſpiration, nor is there often any kind of cough concomitant; ſo that it has been conjectured to proceed from ſome ſpaſm on the vitals. Here therefore the nervous cordial medicines are indicated, and bliſters to the thighs, legs, or arms. Dr Huxham commonly uſed the following bolus and ſaline draught.

R. Pulv. contrayerv. comp. gr. xv.
Croc. Angl. gr. iij.
Confect. Ralegh. ℈j.
Syr. Croci. q. ſ. M. *f. Bolus.*

R. Sal. C. C. ℈ſs.
Succ. limon. ʒiij.
Aq. alexit. ſimpl. ℥iſs. M. *Peracta efferveſcentia, adde Sp. lavend. c. Syr. croc.* ana ʒiſs. *M. f. Hauſt.*

If great tremors and ſubſultus tendinum came on, he ſubſtituted half a ſcruple of muſk inſtead of the contrayerva in the bolus. with advantage. One or other of theſe, or ſimilar preſcriptions, are to be taken every fifth, ſixth, or eighth hour, and a temperate cordial julep may be now and then given out of thin wine or cyder whey, or, which is in many caſes better, out of muſtard-whey; which laſt is by no means a contemptible medicine. The ſaline draught made as above, is much more apt to paſs through the pores of the ſkin than when made with ſalt of wormwood, which rather moves through the urinary paſſages.

The abovementioned difficulty of breathing, anxiety, and oppreſſion, many times precede a miliary eruption, which often appears on the ſeventh, ninth, or eleventh day of the fever, and ſometimes later. Indeed great anxiety and oppreſſion on the præcordia always precede puſtular eruptions of any kind in all ſorts of fevers. This eruption ſhould be promoted by ſoft eaſy cordials and proper diluents; to which ſhould be ſometimes added ſome gentle aromatics. Theſe tend to calm the univerſal uneaſineſs commonly complained of, and alſo very effectually promote a diaphoreſis, or breathing kindly ſweats, with which the miliary eruptions freely and eaſily advance. But however advantageous theſe commonly are, profuſe ſweats are ſeldom or never ſo, even though attended with a very large eruption. Two or three crops of theſe miliary puſtules have been known to ſucceed one another, following profuſe ſweats, not only without advantage, but with great detriment to the patients, as they were thereby reduced to an extreme degree of weakneſs; ſo that they may juſtly be reckoned ſymptomatical rather than any thing elſe, and the conſequent eruption is often merely the ſymptom of a ſymptom; for the miliary glands of the ſkin appear very turgid, and mimic a raſh, after profuſe ſweating, even in the moſt healthy.

In theſe profuſe colliquative ſweatings a little generous red wine (diluted ſomewhat, if neceſſary) may be given with the greateſt advantage; as it preſently moderates the ſweats, ſupports the patient, and keeps up the miliary papulæ if they happen to attend. Towards the decline of the fever alſo, where the ſweats are abundant and weakening, ſmall doſes of the tincture of the bark with ſaffron and ſnake root were given with the greateſt advantage, frequently interpoſing a doſe of rhubarb to carry off the putrid colluvies in the firſt paſſages; which withal makes the remiſſion or intermiſſions that often happen in the decline of nervous diſeaſes more diſtinct and manifeſt, and gives a fairer opportunity of throwing in the bark; for in the proper exhibition of this medicine we are to place our chief hope of curing both the nervous and putrid malignant fevers.

II. Typhus gravior, or the *putrid*, *peſtilential*, or *malignant* FEVER. Sp. I. var. 2.

Febris peſtilens, *P. Sal. Diverſ.* de febre peſtilenti.
Febris peſtilens Ægyptiorum, *Alpin.* de. med. Ægypt. l. i. cap. 14.
Typhus Ægyptiacus, *Sauv.* ſp. 6.
Febris peſtilens maligna, *Sennert.* de febribus, l. iv. cap. 10.
Febris maligna peſtilens, *River*, l. xvii. ſect. iii. cap. 1.
Febris peſtilens maligna, ann. 1643. *Willis*, de febribus, cap. 14.
Typhus carcerum, *Sauv.* ſp. 1.
Febris nautica peſtilentialis, *Huxham* de aëre ad ann. 1740.
Miliaris nautica, *Sauv.* ſp. g.
Febris putrida contagioſa in carceribus genita, *Huxham* de aëre ad ann. 1742.
Miliaris purpurata, *Sauv.* ſp. h.
Febris carcerum et noſocomiorum. *Pringle*, Diſeaſes of the army, p. 294. *Van Swieten*, Maladies des armées, p. 136.
Typhus caſtrenſis, *Sauv.* ſp. 5.
Febris caſtrenſis, quam vulgo cephalalgiam epidemicam vocant, *Henr. Maii* et *A. Ph. Koph.* Diſſ. apud *Hallerum*, tom. v.
Febris Hungarica ſive caſtrenſis, *Juncker*, 74. et *plurium auctorum.*
Febris caſtrenſis Gallorum in Bohemia, ann. 1742. *Scrinci.* Diſſ. apud *Haller.* tom. v.
Febris petechialis, *Sennert.* l. iv. cap. 13. *River.* prax. l. xvii. ſect. iii. cap. 1. *Hoffm.* II. p. 84. *Juncker.* 73. *Huxham* on fevers, chap. 8. *Ludwig.* Inſt. med. clin. nº 146. *Schreiber* von erkentneſs, und cur der Krank heiten. p. 126. *Monro*, Diſeaſes of military hoſpitals, p. 1.
Febris catarrhalis maligna petechizans, *Juncker*, 72. *Hoffm.* II. 75. *Eller.* de cogn. et cur. morb. ſect. vi.
Febris quæ lenticulas, puncticula, aut peticulas vocant, *Fracaſtorius* de morb. contag. lib. ii. cap. 6.
Febris peticularis Tridenti, ann. 1591. *Roboretus* de febr. peticul.
Febris petechialis epidemica Coloniæ ann. 1672. *Donckers* Idia febris petechialis.
Febris petechialis epidemica Poſonii, 1683, *C. F. Loew* in App. ad A. N. C. vol. ii.
Febris petechialis epidemica Mutinæ, 1692. *Ramazzini.* Conſt. Mutinenſis, oper. p. 177.

Febris

Febres.

Febris maligna petechizans, ann. 1698. *Hoffm.* II. p. 80.

Febris petechialis Wratiſlaviæ ann. 1699. *Helwich*, Ephem. Germ. D. III. A. VII. et VIII. obſ. 132. p. 616.

Febris epidemia Lipſiæ 1718. *M. Adolph.* A. N. C. III. obſ. 131. p. 296.

Febris endemica et epidemica Corcagienſis ann. 1708, 1718, et ſeq. *Rogers*, eſſay on epidemic diſeaſes.

Febris continua epidemica Corcagienſis ann. 1719, et ſeq. *M. O'Connel* Obſ. de morbis.

Febris petechialis epidemica Cremonæ 1734. *Valcharengki* Med. ration. ſect. 3.

Febris petechizans Petropoli 1735. *Weitbrecht.* Diſſ. apud Haller. tom. v.

Febris petechialis, ann. 1740, 1741, in Haſſia, *Ritter.* A. N. C. vol. vii. obſ. 4.

Febris maligna petechialis Rintelli 1741. *Furſtenau.* A. N. C. vol. vii. obſ. 5.

Febris petechialis epidemica Sileſiæ 1741 et ſeq. *Bandhorſt.* Diſſ. apud *Haller.* tom. v.

Febris petechialis epidemica Viennæ 1757. *Haſenohrl.* Hiſt. med. cap. 2.

Febris petechialis epidemica Lipſiæ 1757. *Luduvig.* Adverſar. tom. i. pars 1.

Febris petechialis epidemica variis Germaniæ locis ab. ann. 1755 ad 1761. *Strack* de morbo cum petechiis.

Deſcription. This diſeaſe has been ſuppoſed to differ from the former in degree only; and there are many circumſtances which would lead us to conclude, that both frequently originate from a contagion preciſely of the ſame nature. In the ſame manner we ſee, during different ſeaſons, and in different circumſtances, various degrees of malignity in ſmall-pox. Though every inſtance of the diſeaſe depends on the introduction of a peculiar and ſpecific contagion into the body, yet this contagion in particular epidemics evidently poſſeſſes peculiar malignancy. The ſame is probably the caſe with the typhoid fever: But whether this obſervation be well founded or not, there cannot be a doubt that the typhus gravior or putrid fever is a diſeaſe of the moſt dangerous nature, as, beſides the extreme debility of the nervous ſyſtem, there is a rapid tedency of the fluids to putrefaction, which ſometimes cuts off the patient in a few days, nay, in the warm climates, in 12 or 14 hours; or if the patient recovers, he is for a long time, even in this country, in an exceedingly weak ſtate, and requires many weeks to recover his former health.

The putrid fevers, according to Huxham, make their attack with much more violence than the ſlow nervous ones; the rigors are ſometimes very great, though ſometimes ſcarce felt; the heats much ſharper and permanent; yet, at firſt, ſudden, tranſient, and remittent; the pulſe more tenſe and hard, but commonly quick and ſmall; though ſometimes ſlow, and ſeemingly regular for a time, and then fluttering and unequal. The head-ach, nauſea, and vomiting, are much more conſiderable even from the beginning. Sometimes a ſevere fixed pain is felt in one or both temples, or over one or both eye-brows; frequently in the bottom of the orbits of the eyes. The eyes always appear very dull, heavy, yellowiſh, and very often a little inflamed. The countenance ſeems bloated, and more dead-coloured than uſual. Commonly the temporal arteries throb much, and tinnitus aurium is very troubleſome; a ſtrong vibration alſo of the carotid arteries frequently takes place in the advance of the fever, though the pulſe at the wriſt may be ſmall, nay even ſlow: this is a certain ſign of an impending delirium, and generally proceeds from ſome conſiderable obſtructions in the brain.

Typhus.

The proſtration of ſpirits, weakneſs, and faintneſs, are often ſurpriſingly great and ſudden, though no inordinate evacuation happens; and this too ſometimes when the pulſe ſeems tolerably ſtrong. The reſpiration is moſt commonly laborious and interrupted with a kind of ſighing or ſobbing, and the breath is hot and offenſive.

Few or none of theſe fevers are without a ſort of lumbago, or pain in the back and loins; always an univerſal wearineſs or ſoreneſs is felt, and often much pain in the limbs. Sometimes a great heat, load, and pain, affect the pit of the ſtomach, with perpetual vomiting of porraceous or black choler, and a moſt troubleſome ſinguitus; the matter diſcharged is frequently of a very nauſeous ſmell. The tongue, though only white at the beginning, grows daily more dark and dry; ſometimes of a ſhining livid colour, with a kind of dark bubble at top; ſometimes exceeding black; and ſo continues for many days together; nor is the tinct to be got off many times for ſeveral days, even after a favourable criſis: at the height of the diſeaſe, it generally becomes very dry, ſtiff, and black, or of a dark pomegranate colour. Hence the ſpeech is very inarticulate, and ſcarce intelligible. The thirſt in the increaſe of the fever is commonly very great, ſometimes unquenchable; and yet no kind of drink pleaſes, but all ſeem bitter and mawkiſh; at other times, however, no thirſt is complained of, tho' the mouth and tongue are exceedingly foul and dry; this is always a dangerous ſymptom, and ends in a frenzy or coma. The lips and teeth, eſpecially near the height, are furred up with a very black tenacious ſordes. At the onſet of the fever, the urine is often crude, pale, and vapid, but grows much higher-coloured in the advance, and frequently reſembles a ſtrong lixivium, or citrine urine, tinged with a ſmall quantity of blood; it is without the leaſt ſediment or cloud, and ſo continues for many days together; by degrees it grows darker, like dead ſtrong high-coloured beer, and ſmells very rank and offenſive. In petechial fevers, the urine hath often been ſeen almoſt black and very *fetid.* The ſtools, eſpecially near the height, or in the decline of the fever, are for the moſt part intolerably fetid, green, livid, or black, frequently with ſevere gripes and blood. When they are more yellow or brown, the leſs the danger; but the higheſt when they run off inſenſibly, whatever their colour may be. It is likewiſe a very bad ſymptom when the belly continues tenſe, ſwollen, and hard, after profuſe ſtools; for this is generally the conſequence of an inflammation or mortification of the inteſtines. A gentle diarrhœa is often very beneficial, and ſometimes ſeems to be the only way which nature takes to carry off the morbific matter.

Sometimes black, livid, dun, or greeniſh ſpots appear, which always indicate a high degree of malignity; however, the more florid the ſpots are, the leſs danger is to be feared. It is alſo a good ſign when the black or violet petechiæ become of a brighter colour. The large, black, or livid ſpots, are almoſt always attended with profuſe hæmorrhagies; and the ſmall, duſky, brown ſpots, like freckles, are not much leſs dangerous than the livid or black; though they are ſeldom accompanied with fluxes of blood: exceſſively profuſe, cold, clammy ſweats are often concomitant, by which alſo they ſometimes vaniſh, though without any advantage to the patient. The eruption of the petechiæ is uncertain; ſometimes they appear on the fourth or fifth day, though ſometimes not till the eleventh, or even later. The *vibices*, or large dark, blue, or greeniſh marks, ſeldom appear till very near the fatal period. Frequently alſo we meet with an efflореſcence like the meaſles in malignant fevers, but of a much more dull and livid hue; in which the ſkin, eſpecially on the breaſt, appears as it were marbled or variegated. This in general is an ill ſymptom, and is often attended with fatal conſequences.

Sometimes about the 11th or 14th day, on the occurrence of profuſe ſweats, the petechiæ diſappear, and vaſt quantities of white miliary puſtules break out. This is ſeldom found of any conſiderable advantage; but an itching, ſmarting, red raſh, commonly gives great relief; and ſo do the large, fretting, watery bladders, which many times riſe upon the back, breaſt, ſhoulders, &c. A ſcabby eruption likewiſe about the lips and noſe is certainly one of the ſalutary ſymptoms; and the more hot and angry it is, ſo much the better. But of much more uncertain and dangerous event are the brown-coloured aphthæ; nor are thoſe that are exceeding white and thick, like lard, of a very promiſing aſpect. They are ſoon ſucceeded by great difficulty of ſwallowing, pain and ulceration of the fauces, œſophagus, &c. and with an inceſſant ſingultus: the whole *primæ viæ* become at laſt affected; a bloody dyſentery comes on, followed by a ſphacelation of the inteſtines; as is evident from the black, ſanious, and bloody ſtools, extremely fetid and infectious. Vibices, or large, black, and bluiſh marks reſembling bruiſes, are frequently ſeen towards the cloſe of the fever; and, when attended with lividity and coldneſs of the extremities, are certain tokens of approaching death. In ſome caſes, the blackneſs hath been known to reach almoſt to the elbows, and the hands have been dead-cold for a day or two before the death of the patient.

Such are the general appearances of the putrid malignant fever in this country, among thoſe who enjoy a free air, and are not crowded together, or expoſed to the cauſes of infection: but in jails, hoſpitals, or other places where the ſick are crowded, and in ſome meaſure deprived of the benefit of the free air, the ſymptoms are, if poſſible, more terrible. Sir John Pringle, who had many opportunities of obſerving it, tells us, that the jail or hoſpital fever, in the beginning, is not eaſy to be diſtinguiſhed from a common fever. The firſt ſymptoms are ſlight interchanges of heat and cold, a trembling of the hands, ſometimes a ſenſe of numbneſs in the arms, weakneſs of the limbs, loſs of appetite; and the diſorder increaſing towards night, the body grows hot, the ſleep is interrupted, and not refreſhing. With theſe ſymptoms, for the moſt part, there is ſome pain or confuſion in the head; the pulſe at firſt is a little quicker than natural, and the patients find themſelves too much indiſpoſed to go about buſineſs, though too well to be wholly confined. When the fever advances, the abovementioned ſymptoms are in a higher degree; and in particular the patient complains of a laſſitude, nauſea, pains in his back, a more conſtant pain and confuſion in his head, attended with an uncommon dejection of ſpirits. At this time the pulſe is never ſunk, but beats quick, and often varies in the ſame day both as to ſtrength and fulneſs. It is little affected by bleeding once, if a moderate quantity of blood be taken away; but if the evacuation be large, and eſpecially if it be repeated, to anſwer a falſe indication of inflammation, the pulſe, increaſing in frequency, is apt to ſink in force, and often irrecoverably, whilſt the patient becomes delirious. But withal we muſt obſerve, that, in every caſe, independent of evacuations, the pulſe ſooner or later ſinks, and then gives certain intelligence of the nature of the diſeaſe. The appearance of the blood is various; for though it be commonly little altered, yet ſometimes it will be ſizy, not only on the firſt attack, but after the fever is formed. The worſt appearance is when the craſſamentum is diſſolved; though this does not happen till the advanced ſtate of the fever: though indeed this ſeems not eaſy to be aſcertained, as blood has been ſo ſeldom taken away at that time. The urine is alſo various. Sometimes it is of a reddiſh or flame colour, which it preſerves a long time; but it is oftener pale, and changes from time to time in colour as well as crudity, being ſometimes clear, ſometimes clouded: towards the end, upon a favourable criſis, it becomes thick, but does not always depoſit a ſediment. If the ſick lie warm, and have had no preceding flux, the belly is generally bound; but when they lie cold, as they often do in field-hoſpitals, the pores of the ſkin being ſhut, a diarrhœa is a common ſymptom, but is not critical. In the worſt caſes, a flux appears in the laſt ſtage; then the ſtools are involuntary, colliquative, ichorous, or bloody, and have a cadaverous ſmell; the effects of a mortification of the bowels, and the ſigns of approaching death. When the hoſpitals are filled with dyſenteric patients, ſome of the nurſes will be infected with the flux only, and others with this fever, ending in theſe bloody and gangrenous ſtools.

In the beginning the heat is moderate; and even in the advanced ſtate, on firſt touching the ſkin, it ſeems inconſiderable; but upon feeling the pulſe for ſome time, we are ſenſible of an uncommon ardour (the *calor mordicans*, as it has been called), leaving an unpleaſant ſenſation on the fingers for a few minutes after. A day or two before death, if care be not taken, the extremities become cold, and the pulſe is then hardly to be felt. The ſkin is generally dry and parched; though ſometimes there are longer or ſhorter ſweats, eſpecially in the beginning. Such as are produced by medicine are of no uſe, except on the firſt attack, at which time they will often remove the fever; and natural ſweats are never critical till the diſtemper begins to decline. Theſe laſt are rarely profuſe, but gentle, continued, and equally diffuſed over the body: ſometimes the diſeaſe will terminate by an almoſt imperceptible moiſture of the ſkin; the ſweats are uſually fetid, and offenſive even to the patient himſelf.

The tongue is commonly dry; and, without conſtant care of the nurſe, becomes hard and brown, with deep chops: But this ſymptom is common to moſt fevers. At other times, though rarely, the tongue is ſoft and moiſt to the laſt, but with a mixture of a greeniſh or yellowiſh colour. The thirſt is ſometimes great, but more frequently moderate. In the advanced ſtate, the breath is offenſive, and a blackiſh furring gathers about the roots of the teeth.

Some are never delirious, but all lie under a ſtupor or confuſion; few retain their ſenſes till death: many loſe them early, and from two cauſes; either from immoderate bleeding, or the premature uſe of warm and ſpirituous medicines. They rarely ſleep; and, unleſs delirious, have more of a dejected and thoughtful look than what is commonly ſeen in other fevers. The face is late in acquiring either a ghaſtly or a very morbid appearance; yet the eyes are always muddy, and generally the white is of a reddiſh caſt as if inflamed. The confuſion of the head generally riſes to a delirium, eſpecially at night; but, unleſs by an unſeaſonable hot regimen, it ſeldom turns to rage, or to thoſe high flights of imagination common in other fevers. When the delirium comes to that height, the face is fluſhed, the eyes red, the voice is quick, and the patient ſtruggles to get up. But when that ſymptom is owing to large evacuations, or only to the advanced ſtate of the diſeaſe, the face appears meagre; the eye-lids in ſlumbers are only half ſhut; and the voice, which is commonly low and ſlow, ſinks to a degree ſcarce to be heard. From the beginning, there is generally a great dejection and failure of ſtrength. A tremor of the hands is more common than a ſtarting of the tendons; or if the ſubſultus occurs, it is in a leſſer degree than in many other fevers. In every ſtage of the diſeaſe, as the pulſe ſinks, the delirium and tremor increaſe; and in proportion as the pulſe riſes, the head and ſpirits are relieved. Sometimes in the beginning, but for the moſt part in the advanced ſtate, the patient grows dull of hearing, and at laſt almoſt deaf. When the fever is protracted, with a ſlow and low voice, the ſick have a particular craving for ſomething cordial, and nothing is ſo cordial or ſo acceptable as wine. They long for no food, yet willingly take a little panada if wine be added. But ſuch as are delirious, with a quick voice, wild looks, a ſubſultus tendinum, or violent actions, though their pulſe be ſunk, yet bear neither hot medicines, wine, nor the common cordials.

Vomiting, and complaints of a load and ſickneſs at ſtomach, though uſual ſymptoms, are not eſſential to the diſeaſe; nor are pleuritic-ſtitches, difficulty in breathing, or flying pains, to be referred ſo much to it as to the conſtitution of the patient, or to a preceding cold.

A petechial efflореſcence is a frequent, though not an inſeparable, attendant of this fever. It ſometimes appears of a brighter or paler red, at other times of a livid colour, but never riſes above the ſkin. The ſpots are ſmall; but generally ſo confluent, that at a little diſtance the ſkin appears only ſomewhat redder than ordinary, as if the colour was uniform; but upon a nearer inſpection there are interſtices ſeen. For the moſt part this eruption is ſo little conſpicuous, that unleſs it be looked for attentively, it may eſcape notice. The ſpots appear thickeſt on the back and breaſt, leſs on the legs and arms, and Sir John Pringle never remembers to have ſeen any on the face. As to the time of their appearance, he agrees entirely with Dr Huxham. Theſe ſpots are never critical, nor are they reckoned among the mortal ſymptoms; but only concur with other ſigns to aſcertain the nature of the diſeaſe. The nearer they approach to purple, the more they are to be dreaded. In a few caſes, inſtead of ſpots, purple ſtreaks and blotches were obſerved. Sometimes the petechiæ did not appear till after death; and there was one caſe in which, after bleeding, the petechiæ were ſeen only on the arm below the ligature, and no where elſe on the ſkin.

The hoſpital fever, though accounted one of the continued kind, yet has generally ſome exacerbation at night, with a remiſſion and often partial ſweats in the day; and after a long continuance it is apt to change into a hectic, or an intermitting form. The length of the diſeaſe is uncertain. Sometimes it terminated either in death or recovery, in ſeven days after the patient took to his bed; but in the hoſpitals it generally continued from 14 to 20, and ſome died or recovered after four weeks. From the time of the ſinking of the pulſe until death or a favourable criſis, there is perhaps leſs change to be ſeen from day to day in this than in moſt other fevers. When its courſe is long, it ſometimes terminates in ſuppurations of the parotid or axillary glands; and when theſe do not appear, it is probable that the fever is kept up by the formation of ſome internal abſceſs. The parotid glands themſelves do not ſuppurate, but only ſome of the lymphatic glands that lie over them. Sir John Pringle obſerved one inſtance of a ſwelling of this kind on both ſides, without any previous indiſpoſition, when the perſon, not ſuſpecting the cauſe, and applying diſcutient cataplaſms, was, upon the tumor ſubſiding, ſeized with the hoſpital-fever. Many patients after the criſis of this fever complain of a pain in the limbs and want of reſt; and almoſt all of them mention great weakneſs, confuſion in their head, vertigo, and a noiſe in their ears.

Ten of the bodies of thoſe who died of this diſtemper in Houghton's regiment were opened. In ſome, all the cavities were examined; in others, only the brain or the bowels. In ſome of them, the brain appeared to be ſuppurated. The firſt of this kind Sir John Pringle met with at Ghent; but the man being brought into the hoſpital from the barracks no earlier than two days before he died, he could only conjecture from the ſymptoms and the imperfect accounts he had of him, that his death was owing to a fever of this kind, after lingering near a month in it. About three ounces of purulent matter was found in the ventricles of the brain, and the whole cortical and medullary ſubſtance was uncommonly flaccid and tender; nay, ſome of the ſame kind of matter was found in the ſubſtance of the upper part of the cerebellum: yet this perſon, with ſome ſtupor and deafneſs, had his ſenſes till the night before he died; ſo far, at leaſt, that he anſwered diſtinctly when rouſed and ſpoken to; but about that time the muſcles of his face began to be convulſed. Of two other inſtances of men who undoubtedly died of this fever, in one the cerebrum was ſuppurated, in the other the cerebellum. In the former caſe, the patient was under a ſtupor, with deafneſs from the beginning; but was never delirious, nor altogether inſenſible. His pulſe ſunk early; and about ten days before his death his head began to ſwell, and continued very large till within two days before he died, when it ſubſided a little. For ſeveral days before his end, he would taſte nothing but cold water, and during his illneſs he lay conſtantly upon one ſide. The head being opened, an abſceſs as large as an egg was found in the ſubſtance of the fore-part of the right hemiſphere of the brain, full of thin matter like whey. At that time five more, ill of the ſame fever, had the like ſwelling of their heads, but recovered. In the other caſe, the abſceſs in the cerebellum was about the ſize of a ſmall pigeon's egg, and contained alſo a thin ichorous matter: nor had this patient ever been ſo thoroughly inſenſible as not to anſwer reaſonably when ſpoken to. Two days before he died his urine turned pale.

Theſe ſuppurations, however, were not conſtant; for another who died about the ſame time and had been ill about the ſame number of days with the like ſymptoms, the pale water excepted, had no abſceſs either in the brain or cerebellum. And two were opened afterwards, in which the cortical ſubſtance of the brain had an inflammatory appearance, but no ſuppuration. In one of them the large inteſtines were corrupted: that man went off with a looſeneſs; and juſt before he died, an ichorous matter was diſcharged from his noſe. In the military hoſpital at Ipſwich, one who unexpectedly died of this fever after having been ſeemingly in a fair way of recovery, had no ſuppuration in his brain; but in another, who died after an abſceſs in both orbits, the brain was found flaccid, and about two ounces of a thin ſerum in the ventricles.

Cauſes of, and perſons ſubject to, this diſorder. The cauſe of this fever, as well as that of the ſlow nervous fever, is an infection or contagion from ſome diſeaſed animal-body, or from corrupted vegetables; and therefore is very little, if at all, different from thoſe peſtilential diſorders which have ariſen after battles, when great numbers of dead bodies were allowed to lie above ground, and infect the air with their effluvia. This is confirmed by an obſervation of Foreſtus, who was eye-witneſs to a diſtemper of this kind (which indeed he calls a *plague*) owing to the ſame cauſe, attended with buboes and a high degree of contagion. The ſame author alſo gives an account of a malignant fever breaking out at Egmont in North-Holland, occaſioned by the rotting of a whale which had been left on the ſhore. We have a like obſervation of a fever affecting the crew of a French ſhip, by the putrefaction of ſome cattle which they had killed on the iſland of Nevis in the Weſt Indies. Theſe men were ſeized with a pain in their head and loins, great weakneſs, and a diſorder of the ſtomach, accompanied with fever. Some had carbuncles; and on others purple ſpots appeared after death.

Galen aſſigns two cauſes for peſtilential fevers: 1. The great heat of the weather, when the humours happen to be in a more putreſcent ſtate than uſual. 2. A putrid ſtate of the air, ariſing either from a multitude of dead bodies left unburied, as after a battle, or from the evaporation of corrupted lakes and marſhes.

One of the moſt remarkable diſeaſes incident to an army is related by Diodorus, as breaking out among the Carthaginians at the ſiege of Syracuſe. That author not only relates ſome of its moſt diſtinguiſhing ſymptoms, but reaſons well about its cauſe. He obſerves, that pains in the back and eruptions (φλυκταιναι) were common; that ſome had bloody ſtools; that others were ſeized with a delirium, ſo as to run about and beat all that came in their way; that the phyſicians knew no cure; and that it was the more fatal as the ſick were abandoned by every body on account of the contagion. As to the cauſe, the author takes notice of the multitude of people confined within a narrow compaſs; of the ſituation of the camp in a low and wet ground; of the ſcorching heats in the middle of the day, ſucceeded by the cold and damp air from the marſhes in the night-time; to theſe he adds, the putrid ſteams ariſing firſt from the marſhes, and afterwards from the bodies of thoſe who lay unburied.—This diſtemper ſeems to have been a compound of the marſh and peſtilential fever.

Foreſtus remarks, that, from the putrefaction of the water only, the city of Delft, where he practiſed, was ſcarce ten years together free from the plague or ſome peſtilential diſorder. He adds, that the magiſtrates, upon his repreſentation of the cauſe, erected a wind-mill for moving and refreſhing the water. At that time Holland was much more ſubject to inundations and the ſtagnation of water than at preſent. In 1694, a fever broke out at Rochfort in France, which, on account of the uncommon ſymptoms and great mortality, was at firſt believed to be the plague. But M. Chirac, who was ſent by the court to inquire into its nature, found the cauſe to ariſe from ſome marſhes that had been made by an inundation of the ſea; and obſerved, that the corrupted ſteams, which ſmelled like gun-powder, were carried to the town by the wind, which had long blown from that quarter. About two-thirds of thoſe who were taken ill died. In ſuch as were opened, the brain was found either inflamed or loaded with blood; the fibres of the body were uncommonly tender; and the bowels had either ſuppurated or were mortified.

It is needleſs to mention more inſtances of peſtilential fevers being brought on by the ſteams of corrupted ſubſtances, whether animal or vegetable. In general it may be remarked, that the putrefaction of theſe ſubſtances in a dry air is more apt to bring on a fever of the continued form; but in a moiſt air hath a greater tendency to produce remitting fevers. But it muſt alſo be obſerved, that, even in caſes where the moſt malignant fevers prevail, all perſons are not equally diſpoſed to receive the infection, though equally expoſed to it with others. Some, through mere vigour of body and mind, cannot be infected with the moſt contagious diſeaſes; while, on the other hand, thoſe whoſe bodies are debilitated by a former diſeaſe, by ſtudy, low diet, or want, or thoſe who have laboured under any of the depreſſing paſſions of the mind for ſome time, ſeldom or never eſcape. Men, therefore, who have been weakened by accidents (as thoſe who have undergone a mercurial ſalivation) are very apt to fall into this diſtemper. Thoſe who are taken into crowded hoſpitals, ill of the ſmall-pox, however good the ſort may be, fall readily into this fever, and run a greater riſk of dying of it than others. The ſecond fever is attended with double danger, ſeeing the patient has been ſo much weakened by the firſt. A ſure ſign of the corruption of the air in an hoſpital is when many of the nurſes fall ſick.

Prognoſis In theſe fevers we cannot draw a prognoſtic from any ſymptom by itſelf; and perhaps all of them together are more fallible than in others. Generally the following are good: to have little delirium: the ſtrength little impaired; turbid urine in the decline of the diſeaſe; and at that time a gentle ſweat or moiſture diffuſed over the body, or even the ſkin ſoft and the tongue moiſt; or to have ſome looſe ſtools ſucceeded by a diaphoreſis; the pulſe to riſe by wine or cordials, with an abatement of the ſtupor, tremor, and other affections of the brain. Deafneſs is rather a good ſign. A ſediment in the urine, without other changes to the better, is no ſure ſign of recovery; and ſome have recovered in whoſe water there was no ſediment.—The bad ſigns are, a ſubſultus tendinum; the eyes much inflamed and ſtaring; the ſpeech quick, and the ſound of the voice altered; a high delirium; perpetual watchfulneſs; conſtant ſickneſs at the ſtomach, and vomitings; frequent ſtools, with a ſinking pulſe, and the diſorder of the head increaſed; coldneſs of the extremities, and a tremulous motion of the tongue. It is obſerved to be among the worſt ſigns when the patient complains of blindneſs; when he ſwallows with difficulty, or cannot put out his tongue when deſired to do it; when he can lie on his back only, and pulls up his knees; or when inſenſible he endeavours to uncover his breaſt, or makes frequent attempts to get out of bed without aſſigning any reaſon. If to any of theſe are added ichorous, cadaverous, and involuntary ſtools, it is a ſign of a mortification of the bowels and approaching death. It will not ſeem ſtrange to find moſt of theſe prognoſtics common to the advanced ſtate of other fevers, when we conſider, that from whatever cauſe fevers begin, by a long continuance the humours are corrupted, and the brain and nerves affected much in the ſame manner as in thoſe which ariſe from infection.

Prevention and cure. As diſtempers of the putrid kind never ariſe without an infection received from ſome quarter or other, the methods of prevention muſt evidently be reduced to two general heads. 1. To avoid receiving the infection into the body; and, 2. To put the body in ſuch a ſituation as may enable it to reſiſt the infection when received. On both theſe methods ſcarce any writer hath equalled Dr Lind of Haſler, whoſe opinions and directions therefore we ſhall give pretty fully.

As putrid diſeaſes are very common and violent in the hot countries, it is very neceſſary for Europeans who viſit theſe climates to be well informed, in the firſt place, of the ſigns of an unhealthy country, that they may be upon their guard as ſoon as they enter any foreign region. Theſe ſigns are by our author enumerated as follows.

1. A ſudden and great alteration in the air, at ſunſet, from intolerable heat to a chilling cold. This is perceived as ſoon as the ſun is down, and is for the moſt part accompanied with a very heavy dew: it ſhows an unhealthy ſwampy ſoil, the nature of which is ſuch, that no ſooner the ſun beams are withdrawn, than the vapours emitted from it render the air damp, raw, and chilling, in the moſt ſultry climates; ſo that even under the equator, in ſome unhealthy places, the night-air is very cold to a European conſtitution.

2. Thick noiſome fogs, chiefly after ſunſet, ariſing from the valleys, and particularly from the mud, ſlime, or other impurities. It hot climates, the ſmell of theſe fogs may be compared to that of a new cleaned ditch. Diſeaſes therefore, ariſing from this cauſe, generally take place in the night, or before ſun-riſing.

3. Numerous ſwarms of flies, gnats, and other inſects which attend ſtagnated air and unhealthy places covered with wood.

4. When all butchers meat ſoon corrupts, and in a few hours becomes full of maggots; when metals are quickly corroded on being expoſed to the air; and when a corpſe becomes intolerably offenſive in leſs than ſix hours; theſe are proofs of a cloſe, hot, and unwholeſome country. And in ſuch places, during exceſſive heats and great calms, it is not altogether uncommon for Europeans, eſpecially ſuch as are of a groſs habit of body, to be ſeized at once with the moſt alarming and fatal ſymptoms of what is called the *yellow fever*, without even any previous complaint of ſickneſs or other ſymptoms of the diſeaſe. There has firſt been perceived an uneaſy itching ſenſation, commonly in the legs; and upon pulling down the ſtockings, ſtreams of thin diſſolved blood followed, a ghaſtly yellow colour quickly diffuſed itſelf over the whole body, and the patient has been carried off in leſs than forty-eight hours.

5. A ſort of ſandy ſoil, commonly a ſmall, looſe, white ſand, as that at Penſacola, Whydah, and the iſland of Bonaviſta, which is found by experience to be injurious to health. The peſtiferous vapour ariſing, during the ſummer months and in the heat of the day, from ſuch a ſandy ſoil, is beſt characteriſed by its effects in the extenſive deſarts of Aſia and Africa. It there conſtitutes what is called the *Semiel-wind*; a blaſt which, in the parched deſart, proves inſtantly fatal both to man and beaſt: but when it paſſes over a ſoil well covered with graſs and vegetables, has its effects greatly mitigated; it is, however, even then, productive of ſickneſs: thus the ſoutherly winds, while they blow from the deſarts of Libya during the ſummer, at Algiers, Tunis, and Tripoli, produce an unhealthy ſeaſon; and at Madras the winds, which, in the months of April and May, paſs over a large tract of ſand, are always hot, diſagreeable, and unwholeſome.

During theſe land-winds, ſudden guſts of a more hot and ſuffocating nature are often obſerved to come from theſe ſands once or twice, or even more frequently, in a day, which ſeem to be this vapour in a purer form. Theſe guſts paſs very quickly, and affect perſons who happen to ſtand with their faces towards them in the ſame manner as the hot air which iſſues from a burning furnace, or from a heated oven, and obliges them immediately to turn away from it in order to recover breath. The effect of this hot ſuffocating blaſt or vapour on the human body, even when mitigated by paſſing through a moiſt atmoſphere, is the ſame as that of intenſe cold; it ſhuts up every pore of the ſkin, and entirely ſtops the perſpiration of ſuch as are expoſed to it. Theſe blaſts come only in the day time, and always from the deſarts. Water is the only known corrector or antidote againſt them: hence, coarſe thick clothes, kept conſtantly wet, and hung up at the windows or doors, greatly mitigate their violence. A houſe ſo built as to have no windows or doors towards the deſarts, is an excellent protection againſt their pernicious effects. The hot land-winds conſtantly blow at Madras and other places on the coaſt of Coromandel, at that ſeaſon, from midnight till noon: the ſea-breezes then begin, which relieve the difficulty in breathing, and the obſtructed perſpiration which the former occaſioned.

That the heat of theſe land-winds, as alſo of the ſudden guſts which accompany them, proceed from large tracts of ſand heated by the ſun, is evident from the increaſed heat and ſuffocating quality of theſe winds, in proportion as the day advances, and as the heat of the ſeaſon is increaſed. The oppoſite winds, blowing from each ſide of the Balagate-mountains, are a farther proof of this. Theſe mountains, running from north to ſouth divide the hither Peninſula of India into two unequal parts, and ſeparate what is called the *Malabar* from the *Coromandel* coaſt. To the former they are very near, but at a great diſtance from the latter. The winds blowing from thoſe hills are on the Malabar-coaſt always remarkably cool; but on the coaſt of Coromandel, in the months of April, May, June, and July, are extremely hot and ſuffocating, as they paſs over a large tract of intermediate ſand, heated during thoſe months by an almoſt vertical ſun. Hence the Malabar coaſt is always covered with an agreeable verdure; whereas the Coromandel coaſt during the continuance of theſe cool winds, ſeems a barren wilderneſs, nothing appearing green except the trees. On the contrary, the winds that paſs over theſe ſands, after being wet with the rains, are the coldeſt which blow at Madras. Bottles of liquor incloſed in bags of coarſe cloth, kept conſtantly wet, and ſuſpended in the ſhade, where thoſe hot winds may have acceſs to them, become as cold as if they had been immerſed in a ſolution of nitre; an effect owing undoubtedly to the conſtant evaporation of water from the ſurface.

It is an obſervation of the natives on the coaſt of Coromandel, which is confirmed by the experience of many Europeans, that the longer the hot land-winds blow, the healthier are the enſuing months; theſe winds, as they expreſs it, purifying the air. Are not the winds therefore the cauſe why the air on the coaſt of Coromandel, except during their continuance, is more healthy than in other parts of India where theſe winds do not blow? Does not this alſo ſuggeſt a very probable reaſon, why the plague in Egypt generally ceaſes in the beginning of June; the periodical hot winds which come from the deſarts of Nubia and Ethiopia having then rendered the air of Egypt pure and wholeſome? Many have aſcribed that effect to the north-winds; as the plague not only ceaſes when they blow, but all infected goods, houſehold-furniture, and wearing apparel, are then ſaid to become entirely free from the contagion: theſe, however, cannot be the cauſe, as the moſt deſtructive plague is abated in its violence, if not wholly eradicated, before they ſet in. With equal propriety we may reject the opinion that the overflowing of the Nile is productive of that ſalutary effect, as the plague generally ceaſes before the increaſe of that river is perceptible.

Thus the plague, the greateſt calamity which can afflict mankind, ſeems to be deſtroyed by thoſe hot winds, which are otherwiſe ſo pernicious to animal and vegetable life. And although, during the continuance of theſe winds, the moſt fruitful fields wear the aſpect of a parched deſart; yet no ſooner the rains fall, but vegetation is reſtored, the plants revive, and beautiful verdure is again ſpread over the face of the country.

Having thus given an account of the ſigns of an unhealthy country, Dr Lind next proceeds to mention ſuch employments as are particularly dangerous to Europeans on their firſt arrival. One of theſe is the cutting down of trees, ſhrubs, &c. or *clearing the ground*, as it is called. Of the unhealthineſs of this employment he gives two inſtances. At the concluſion of the late peace, the captain of a ſhip of war went on ſhore at the iſland of Dominica, with 12 of his men, to cut down the wood, and to clear a piece of ground which he intended to have purchaſed: but, in a few days, ſickneſs obliged him to deſiſt from this dangerous work; the captain and 11 of his men being ſeized with violent fevers, which terminated in obſtinate intermittents, and of which ſeveral died. The ſurvivors ſuffered ſo much in their conſtitutions, that, even after they came to England, the return of an eaſt wind was apt to bring on a violent fit of the ague. The Ludlow-Caſtle, a ſhip of war of 40 guns, in a voyage to the coaſt of guinea, alſo loſt 25 of her men at Sierra Leona, who were employed in cutting down wood for the ſhip. This is an occupation which has often proved deſtructive to Europeans in thoſe climates, and in which they ought never to be employed, eſpecially during the rainy ſeaſon. There being numberleſs inſtances of white perſons, when cutting down the woods at that ſeaſon, who have been taken ill in the morning, and dead before night.

Another evil, leſs known, and leſs ſuſpected, but no leſs dangerous, is the ſending of Europeans in open boats after ſunſet, where the ſoil is ſwampy, or where there are great night-fogs. The ſingle duty alone of fetching freſh-killed butchers meat at night for the uſe of our ſhips companies in the Eaſt and Weſt Indies, has deſtroyed every year ſeveral thouſand ſeaman. In thoſe parts of the world, butchers meat muſt be brought on board at night immediately after it is killed, otherwiſe it will not be fit for uſe the next day; but a contract made with the natives to ſend it on board at that time, which might be done for a triffling ſum, would be the means of preſerving many uſeful lives. During the ſickly ſeaſon at Batavia, a boat belonging to the Medway, which attended on ſhore every night, was three times ſucceſſively manned, not one having ſurvived that ſervice. They were all taken ill in the night, when on ſhore, or when returning on board; ſo that at length the officers were obliged to employ none but the natives on that buſineſs. Great numbers of men have periſhed from being employed in this manner at Bengal, where the European ſhips often anchor in the moſt unhealthy ſpots of the river; and even when the great night-fogs ariſe, after the rainy ſeaſon, the men are often obliged to perform ſuch night-ſervices in boats, Now ſince it is ſo dangerous for Europeans in unhealthy countries, particularly during a ſeaſon of ſickneſs, to be expoſed in an open boat to the foggy night-air, it muſt appear, that ſending them unſheltered, in open boats, far up rivers, in unhealthy ſouthern climates, for the ſake of wood, water, trade, or other purpoſes, muſt be attended with the moſt deſtructive and fatal conſequences.

Burying the dead in ſwampy countries is another occupation which has proved fatal to many, and which ought to be entruſted to negroes or the natives of the country. The effluvia from the ground when newly opened, whether from graves or ditches, are far more dangerous than from the ſame ſwampy ſoil when the ſurface is undiſturbed; nay, in ſome places, it has been found almoſt certain death for an European to dig a grave, unleſs long ſeaſoned to the country. In ſuch a place, the attendance of friends at funerals ought to be diſpenſed with.

In all caſes where it is practicable, the ſhips which viſit theſe unhealthy countries ſhould anchor at as great a diſtance as poſſible from ſhore; or if obliged to anchor near marſhy grounds or ſwamps, eſpecially during ſummer or in hot weather, and when the wind blows directly from thence, the gun-ports which would admit the noxious land-breeze ought to be kept ſhut, eſpecially at night. Or if the ſhip rides with her head to the wind, a thick ſail ought to be put upon her foremaſt, along which the ſmoke from the fire-place might be made conſtantly to play and aſcend. If the ſail ſhould occaſion a little ſmoke between decks, this inconvenience will be ſufficiently compenſated by its keeping off the direct ſtream of the ſwampy ſhore effluvia; which now being obliged to form a curve before they reach the more diſtant parts of the veſſel, muſt needs be greatly diverted and ſcattered.

The beſt preſervative againſt the miſchievous impreſſions of a putrid fog, or of a marſhy exhalation, is a cloſe, ſheltered, and covered place; ſuch as the lower apartments in a ſhip, or a houſe in which there are no doors or windows facing the ſwamps. If in ſuch places a fire be kept either at the doors and other inlets to a houſe, or in the chambers, as is practiſed in ſome unhealthy countries during the rainy or foggy ſeaſon, it will prove an excellent and effectual protection againſt the injuries of a bad air. On board of ſhips alſo fires may be made at the hatchways; and of the good effects of this we have the following example. When the Edgar, a ſhip of war of 60 guns, was upon the coaſt of Guinea in the year 1768, her men were very ſickly, and many of them died: however it was obſerved, that in a ſloop of war, which was conſtantly in company with her, few were taken ill, and not one died during the whole voyage. This could be aſcribed to no other cauſe, but that in the ſloop the fire-place for cooking victuals was on the ſame level with the deck where the men lay; and every morning when the fire was lighted, eſpecially when there was but little wind, the ſmoke from the cook-room ſpread itſelf all over the ſhip, and particularly over thoſe parts where the men lay; but from the conſtruction of the fire-place of the Edgar, no ſmoke from it ever came between her decks.

Perſons on board any ſhip whatever, are much more ſafe, and their ſituation is much preferable to that of thoſe who make diſtant inland excurſions in ſmall boats upon the rivers, and who are for the moſt part ignorant of the cauſe of thoſe maladies which deſtroy them. The intolerable heat at noon often obliges ſuch perſons to go in a manner half-naked; while a free and plentiful perſpiration iſſues from every pore. A near approach to putrid ſwamps at this time is apt to produce an immediate ſickneſs, vomiting, and afterwards a low nervous or malignant fever. But if they happen to paſs them at night, or lie near them in an open boat, the air from thoſe ſwamps is perceived to be quite chill and cold; in ſo much that warm thick clothing becomes abſolutely requiſite to guard the body againſt the impreſſions of ſo great an alteration in the air, and againſt its cold and inclement quality: for the effects of it then, even on the moſt healthy and vigorous conſtitution, is frequently a chilling cold fit of an ague, terminating in a fever with delirium, bilious vomitings, a flux, or even death itſelf.

But where ſuch expoſure becomes unavoidable, the only method is then to defend the body as much as poſſible againſt the pernicious miaſmata with which the air abounds. All thoſe who are employed in cutting down woods, or in other laborious and dangerous ſervices in hot climates, during the heat of the day ought to have their heads covered with a bladder dipt in vinegar, and to waſh their mouths often with the ſame liquor; never to ſwallow their ſpittle, but rather to chew a little rhubarb or ſome other bitter, and ſpit it out frequently; to ſtop their noſtrils with a ſmall bit of linen or tow dipped in camphorated vinegar; and to infuſe ſome bark, garlic, and rhubarb, in brandy, of which a dram is to be taken, either by itſelf or diluted with water morning and evening.

In the evening before ſunſet they ſhould leave off work, and not return to their labour in the morning till the ſun has diſperſed the unwholeſome dews and vapours. Thoſe who muſt of neceſſity remain on ſhore, and ſleep in dangerous places, muſt take care not to ſleep upon the ground expoſed to the dews, but in hammocks in a cloſe tent, ſtanding upon a dry ſand, gravel, or chalk, near the ſea ſhore, and where there is no ſubterraneous water for at leaſt four feet below the ſurface of the ground. The door of this tent ſhould be made to open towards the ſea; and the back part of it, which receives the land breeze, muſt be well ſecured by double canvas, or covered with branches of trees. But in ſuch circumſtances, a hut, when it can be procured, is preferable to a tent, eſpecially if it be well thatched, ſo as to prove a defence both againſt the exceſſive heat of the ſun by day, and the noxious dews which fall at night. Here the men may be enjoined to ſmoke tobacco. When the air is thick, moiſt, and chill, the earth being overſpread with cold dew, a conſtant fire muſt be kept in and about the tent or hut, as the moſt excellent means of purifying ſuch unwholeſome air, and of preſerving the health of thoſe who either ſleeping or waking are expoſed to its influence. The centinels who guard the water-caſks, ought likewiſe at ſuch a time to have a fire burning near them. All old and forſaken habitations, natural caves and grottos in the earth, where the men may be induced to take up their abode, muſt before their admiſſion be perfectly dried and purified with ſufficient fires. Fire and ſmoke are undoubtedly the great purifiers of all tainted and unwholeſome air, and the moſt excellent preſervatives againſt its noxious influence. It is the cuſtom of the negroes in Guinea, and alſo of ſome Indians (who both ſleep for the moſt part on the ground), to have a fire producing a little ſmoke, conſtantly burning in their huts where they ſleep. This not only corrects the moiſture of the night, but alſo, by occaſioning more ſmoke than heat, renders the damp from the earth leſs noxious; of which Dr Lind gives the following remarkable inſtance. A Guinea ſhip being up one of the rivers for the ſake of trade, it was found to be very dangerous to ſleep on ſhore; without which their trade could not be ſo conveniently carried on. Firſt the captain, then the mate, and two or three of the ſeamen, were taken ill; each of them the morning after they had lain on ſhore. By theſe accidents the men were greatly intimidated from lying aſhore; till the ſurgeon boldly offered to try the experiment on himſelf. Next morning when he waked, he found himſelf ſeized, as the reſt, with a giddineſs and pain in the head, &c. He immediately acquainted one of the negroes with his condition, who carried him to his hut, and ſet him down in the ſmoke of it; when his giddineſs and ſhiverings ſoon left him. He then took a dram of the bark bitter; and found himſelf greatly relieved, eſpecially by breathing ſome time in the ſmoke.—Thus inſtructed by the negro, he ordered a large fire to dry the hut he ſlept in; and afterwards had every night a ſmall fire ſufficient to raiſe a gentle ſmoke, without occaſioning a troubleſome heat: and by this means he and ſeveral others, uſing the ſame precautions, ſlept many nights on ſhore without any inconveniencence.

Fire and ſmoke indeed are found to be certain correctors, or rather deſtroyers, of infection in all caſes, whether ariſing from the noxious effluvia of marſhes, or from the contagion of diſeaſed bodies. Even thoſe moſt extraordinary and fatal damps called *harmattans*, are unable to reſiſt the ſalutary effects of ſmoke. In other caſes, Dr Lind remarks, that, under ſome circumſtances, the ſource of an infection in a ſick chamber or any other place, may be removed or deſtroyed by accidental means, for which we cannot account, and which we often cannot aſcertain. But it oftener happens, that it is very difficultly rooted out; and that exact cleanlineſs, with the benefit of a pure air, often proves inſufficient to remove the evil. Smoke, however, has never been known to fail. It is not to be doubted, that excepting the true plague, there has been an infection fully as peſtilential and as mortal in ſome ſhips as in any other place whatever; yet it has never been heard, that any ſhip, after having been carefully ſmoked, did not immediately become healthy: and if afterwards they turned ſickly, it was eaſy to trace that ſickneſs from other infected ſhips, jails, and the like places.

There are three methods practiſed for purifying veſſels after the men have been removed out of them. The firſt is by burning of tobacco. A quantity of tobacco is ſpread on ſeveral fires, made with ſuch old pieces of rope as are called *junk*. Theſe are diſperſed into different places of the ſhip, and the heat and ſmoke afterwards cloſely confined below for a conſiderable time.—The ſecond method is by charcoal-fires ſtrewed with brimſtone. The heat and ſteam of theſe burning materials muſt alſo be long and cloſe ſhut up: but, although this fume, properly applied, has been found by experience to purify moſt effectually tainted apartments, ſhips, clothes, &c. yet there are ſome kinds of vermin which it will not deſtroy, particularly lice. The third method of purification is performed by the addition of arſenic to the materials of the ſecond proceſs, in the following manner. After carefully ſtopping up all the openings and every ſmall crevice of the ſhip (as was alſo neceſſary in the preceding proceſſes), a number of iron pots, properly ſecured, are to be placed in the *hold*, *orlops*, *gun-deck*, &c. Each of theſe are to contain a layer of charcoal at the bottom, then a layer of brimſtone, and ſo alternately three or four layers of each, upon which the arſenic is to be ſprinkled, and on the top of it ſome oakum dipped in tar is to be laid to ſerve as a match. The men, upon ſetting fire to the oakum, muſt ſpeedily leave the place, ſhutting cloſe the hatchway by which they came up.

From the known and experienced efficacy of theſe proceſſes, it appears, that fire and ſmoke are the moſt powerful agents for annihilating infection; and, it may be preſumed, even the plague itſelf. This is in ſome meaſure agreeable to what we learn from the ancient records of phyſic. But the prepoſterous uſe, or rather abuſe, of fire on ſuch occaſions, has cauſed its effects to be diſregarded by ſome, and to be ſuſpected of miſchief by others. The modern practice of burning large fires in the open air, in the ſtreets, and about the walls of towns infected with the plague or other contagion, is founded on principles groundleſs and erroneous; and has therefore been found by experience not only unſucceſsful, but hurtful. But though this muſt be allowed, it doth not thence by any means follow, that when once a houſe hath been infected, and the patients removed from it, the doors and windows at the ſame time being ſhut, that ſuch fires will then prove hurtful; or that, by this method of purification, all the ſeeds of contagion will not be effectually deſtroyed. Whenever, therefore, perſons die of a ſpotted fever, a malignant ſore throat, the ſmall-pox, or any diſtemper found to be communicable from the ſick to others, the corpſe ought quickly after death to be removed into another room; that in which the perſon died ſhould be well aired, by having the windows opened, till a charcoal-fire be kindled, with ſome rolls of ſulphur upon it; after which, both doors and windows ſhould be kept ſhut for a conſiderable time, not leſs than eight or ten hours, till the room be thoroughly ſmoked. In ſeveral ſhips, where there are the faireſt opportunities of trying and judging things of this nature, the contagion of the ſmall-pox has been entirely ſtopped by wood-fires, ſprinkled with brimſtone, kept burning and cloſely confined in the infected place. In a word, a judicious and proper application of fire and ſmoke is the beſt means for the deſtruction and utter extinction of the moſt malignant ſources of diſeaſe; and they are beſides the greateſt purifiers of all bad and tainted air.

Next to the ſmoke of wood for purifying a tainted air, that of gun-powder is to be eſteemed the beſt; and it has this further good property, that it is entirely inoffenſive to the lungs. The caſcarilla-bark, when burning, gives a moſt agreeable ſcent to the chamber of the ſick, ſo is at leaſt an elegant preſervative, and may prevent bad ſmells from taking effect. The ſteam of camphorated vinegar warmed, is ſtill more powerful for this purpoſe. But, beſides correcting the ill quality of the air, and purifying the chamber, another good effect is produced from ſuch ſteams and ſmoke as are inoffenſive to the lungs. As ſoon as the vapour becomes denſe, the nurſes and patients become deſirous of the admiſſion of freſh air by the door or windows. Now it is certain, that the air in the chambers of the ſick cannot be too often changed, provided the patient be well covered, and the curtains of his bed, if neceſſary, be drawn cloſe. No argument is ſo forcible to obviate the danger of foul air in a room or ward (occaſioned by the obſtinacy of nurſes or relations), as ordering it to be frequently fumigated or ſmoked: A practice more frequent in other countries than in this, but of great benefit to the ſick.

Laſtly, with regard to the method of purifying goods, moveables, clothes, &c. which are ſuppoſed to harbour infection, it muſt be obſerved, that the uſual cuſtom of only unpacking and expoſing ſuch materials to the open air, is in many inſtances inſufficient to deſtroy the latent ſeeds of diſeaſe. It is certain indeed, that in moſt caſes the contagious particles are more readily and fatally communicated from the clothes of a ſick perſon than from his body. The ſpreading abroad, therefore, of contaminated clothes to dry or to be aired, without a previous fumigation of them, may be of dangerous and fatal conſequence. All ſuch ſuſpected ſubſtances ſhould be firſt fumigated in a cloſe place, and in the ſame manner as an infected chamber, after which they may be ſpread abroad and expoſed to the air. In infectious diſeaſes, eſpecially fevers, the linen of the ſick, or ſuch clothes about them as will admit of being waſhed, ought never at firſt to be put in warm water, as it is dangerous to receive the ſteam that may hence ariſe. It is neceſſary to ſteep them firſt either in cold water or in cold ſoap-lees for ſeveral hours, that the filth may be waſhed off.

We muſt now proceed to give an account of the method of cure, after the methods of preventing the infection from being received into the body have either been neglected or proved ineffectual. Here it is of the utmoſt importance to take the diſeaſe in the very beginning, before it hath time to corrupt the fluids to ſuch a degree as to endanger life. In theſe ſlight degrees of infection, a vomit properly adminiſtered, eſpecially if ſucceeded by a bliſter, never fails to remove the diſorder, and prevent the fever which would otherwiſe unavoidably follow. Of this Dr Lind gives the following inſtances. A lady afflicted with the bilious cholic, had intolerably fetid diſcharges of corrupted matters upwards and downwards. A gentlewoman, only in paſſing the room, was immediately ſeized with a retching and ſickneſs, which continued 24 hours. The nurſe who attended was ſuddenly ſeized with a giddineſs and vomiting from the bad ſmell, which, as ſhe expreſſed it, reached into her ſtomach. The vomiting became more ſevere at night, accompanied with a purging and frequent ſhiverings. By means of an emetic both evacuations were ſtopped: notwithſtanding which, for ſome days afterwards, ſhe continued to have frequent tremors, and a violent head-ach, with a low irregular pulſe; and did not recover ſo ſoon as the patient.

Such ſlight degrees of infection have been often obſerved to be derived from patients of a groſs habit of body when labouring under inflammatory diſtempers, and even other complaints. A man was ſent to Haſlar Hoſpital ſuppoſed to have a fever. He was furiouſly delirious, with a quick full pulſe. Notwithſtanding plentiful evacuations, this delirium continued for two months with ſhort intervals; when the caſe was found to be plainly maniacal. A nurſe, upon raiſing this perſon up in her arms, perceived an intolerably bad ſmell, and was inſtantly ſeized with ſhiverings, ſickneſs, and head-ach. Finding herſelf very ill, ſhe took a vomit in ſix hours afterwards, and paſſed the night in profuſe ſweats by means of a ſudorific draught. Next morning the violence of the head-ach was but little abated; upon every attempt to move, ſhe complained of a burning heat and pain in her forehead, and became giddy. Her inclination to drink was frequent, and her pulſe low and quick. A bliſter was immediately applied to the back; as ſoon as the bliſter took effect, the head-ach and thirſt entirely left her, and the pulſe was calm. Next day ſhe aroſe and was well.

Many ſimilar inſtances of infection have been obſerved from putting the dead into their coffins. In particular, one man, who, from performing that duty to his meſſmate, was ſo ill, even after the operation of the vomit, as to require a bliſter. In the courſe of one week two nurſes were infected by a perſon in the ſmall-pox. Both were ſeized in like manner with ſhiverings, ſickneſs, and head-ach; the one upon receiving the patient's breath, the other upon making his bed. In the one, a pain darted into her breaſt; in the other, into the breaſt and in the ſmall of the back. The complaints of the former were ſpeedily removed by a vomit, though ſhe continued to have irregular returns of ſhiverings for three days afterwards. But in the latter, though the head-ach, ſickneſs, and rigors, were greatly abated by the vomit, yet a conſtant heat and thirſt, with a low pulſe, and a violent pain in the breaſt, indicated the neceſſity of applying a bliſter to the affected parts, which next morning removed all her complaints.

A perſon is often immediately ſenſible of his having received an infection from the firſt attack: they generally compare the firſt impreſſion to an earthy, diſagreeable ſmell, reaching down as they expreſs it, into their throats, as from a grave newly opened, but not quite ſo raw as the cadaverous ſtench; and the effects of it, ſhivering and ſickneſs, are inſtantaneous. It is a ſmell difficult to deſcribe; but it is well known to the nurſes and attendants about the ſick, as it uſually accompanies fevers of extreme malignity, and, with the peculiar diſcharges from the bliſtered parts, may be reckoned among the moſt conſtant ſymptoms of a bad fever. Some compare the ſmell to that of rotten ſtraw. It often reſembles the diſagreeable ſmell of a perſon labouring under the confluent ſmall-pox at their turn, though not ſo ſtrong. One perſon, on receiving the infection, was ſenſible of ſomething like an electric ſhock through his body. But many are not ſenſible of any effect from an infection at firſt; and an infection from a fever will ſometimes continue for many days, nay weeks, diſcovering itſelf chiefly by irregular ſhiverings, ſometimes ſo ſevere as to oblige the patients to have re-

recourſe to their beds once or twice a-day; ſometimes every other day. Among a number thus affected, it alſo appears, that ſuch as are put into unſeaſoned chambers, or have ſat down on the cold ground, lain in raw damp apartments, &c. are immediately ſeized with a ſickneſs at ſtomach, ſometimes with a dangerous purging, and often with fevers accompanied with bad ſymptoms, which others have entirely eſcaped.

It now remains to conſider the proper method of curing putrid fevers, on the ſuppoſition that the infection has been allowed to operate till the blood becomes radically tainted, and of conſequence the nervous ſyſtem effected to ſuch a degree, that its power cannot be reſtored by any of the ſimple medicines abovementioned. Here all authors agree, that a change of air, when it can be effected, is abſolutely neceſſary, and often contributes more towards the removing of the diſeaſe than all the medicines than can be exhibited. The utility of this change will appear from what hath been formerly ſaid; and we ſhall only further allege one inſtance from Dr Lind, in which the effects of bad air appear to a degree almoſt incredible. "It is remarkable (ſays he), that in the laſt war, the Engliſh ſhips which touched at Batavia ſuffered more by the malignant and fatal diſeaſes of that climate, than they did in any other part of India, if we except a fatal ſcurvy which once raged in that fleet at ſea. Soon after the capture of Manila, the Falmouth, a ſhip of 50 guns, went to Batavia, where ſhe remained from the latter end of July to the latter end of January; during which time ſhe buried 100 ſoldiers of the 79th regiment and 75 of the ſhips company; not one perſon in the ſhip having eſcaped a fit of ſickneſs, except her commander Captain Brereton. The Panther, a ſhip of 60 guns, was there in the years 1762 and 1764; and both times during the rainy ſeaſon. In the former of theſe years, ſhe buried 70 of her men; and 92 of them were very ill when ſhe left the place. In the year 1764, during a ſhort ſtay, 25 of her men died. The Medway, which was in company with her, loſt alſo a great number of men. Nor was the ſickneſs at that time confined to the ſhips; the whole city afforded a ſcene of diſeaſe and death: ſtreets crowded with funerals, bells tolling from morning to night, and horſes jaded with dragging the dead in hearſes to their graves. At that time a ſlight cut of the ſkin, the leaſt ſcratch of a nail, or the moſt inconſiderable wound, turned quickly to a ſpreading putrid ulcer, which in 24 hours conſumed the fleſh even to the bone. This fact is ſo extraordinary, that, upon a ſingle teſtimony, credit would hardly be given to it; yet on board the Medway and Panther they had the moſt fatal experience of it, and ſuffered much from it."

But where a change of air is impracticable or ineffectual, and where the fever hath already made ſome progreſs, Sir John Pringle generally took away ſome blood if the pulſe was full. When the ſymptoms run high, a plentiful evacuation of that kind ſeemed indicated; yet it was obſerved that large bleedings generally did harm, by ſinking the pulſe, and affecting the head. Nor was a moderate bleeding to be repeated without caution; even thoſe whoſe blood was ſizy, unleſs their lungs were inflamed, were the worſe for a ſecond bleeding. If the head only ſuffered, it was much ſafer to uſe leeches than to open a vein in the arm; but in the delirium with a ſunk pulſe, even leeches were hurtful. Many recovered without letting blood, but few who loſt much of it.

Vomits alſo muſt be uſed with caution; for though they may be of uſe by way of prevention, yet in the advanced ſtate of the diſeaſe, when the patient has all along complained of ſickneſs at ſtomach, they are evidently unſafe. Here the antiſeptic quality of fixed air is of much uſe, and the neutral draughts given in the act of efferveſcence are generally attended with happy effects. Nay, clyſters of fixed air itſelf have been found very ſerviceable. Even in very bad ſtages of the diſtemper, where a putrid and colliquative looſeneſs has taken place, clyſters of fixed air have been known to alleviate the ſymptoms. We muſt not, however, put too much confidence in medicines of this kind. Mild aſtringent cordials, eſpecially wine and Peruvian bark, are the only reſources in theſe diſorders. Concerning the former, Sir John Pringle obſerves, in the low ſtate of theſe fevers, and in great ſinkings, which either come after unſeaſonable bleedings or long want of nouriſhment, it was a moſt grateful and efficacious cordial, to which nothing was comparable. The common men had an allowance, from a quarter to half a pint in a day, of a ſtrong kind, made into whey, or added to the panada which was their ordinary food. But to others out of the hoſpital, he uſually preſcribed Rheniſh or a ſmall French wine, whereof ſome conſumed near a quart per day, and part of that undiluted. Nay, ſo great was the virtue of wine in this ſtage of the fever, that ſeveral were known to recover from the loweſt condition, when refuſing the bark on account of its taſte, they took nothing but a little panada with wine and a volatile diaphoretic mixture every two or three hours by turns. Perhaps there is no rule more neceſſary in this ſtate, than not to let the patient when low remain long without taking ſomething cordial and nouriſhing; as many have been obſerved paſt recovery, by being ſuffered to paſs a whole night without any ſupport about the time of the criſis. In the advanced ſtate of this fever the ſick are remarkably low; and therefore Hoffman adviſes in ſuch caſes, that they ſhould be conſtantly kept in bed, and not permitted even to ſit up in it. In the laſt ſtage of this fever, as well as in that of the ſea-ſcurvy, it would ſeem that the force of the heart was too ſmall to convey the blood to the brain, except when the body is in an horizontal poſture.

But, however neceſſary wine and the bark may be in the low ſtage of this fever, we muſt remember, that theſe remedies are to be adminiſtered only as antiſeptics and ſupporters of the *vis vitæ*, without aiming at thoroughly raiſing the pulſe or relieving the head, or at forcing a ſweat by them, before nature points that way, and which Sir John Pringle ſeldom obſerved before the 14th day. For though the patient may die before that time if he has been largely bled, or if the cordial medicines have been given him too freely, yet ſuch means as he made uſe of were not powerful enough to bring on a criſis ſooner.

In the low ſtate of the hoſpital-fever, a ſtupor was a conſtant attendant, which was very apt, in the evening, to change to a ſlight delirium. If this was all, as being in the common courſe, nothing was done. But if the delirium increaſed upon uſing wine, if the eyes looked wild, or the voice became quick, there was reaſon to apprehend a phrenitis; and accordingly it was obſerved, that at ſuch times all internal heating medicines aggravated the ſymptoms; and in theſe caſes bliſters were of the greateſt ſervice. Fomentations of vinegar and warm water for the feet, our author is of opinion would anſwer better than either ſinapiſms or bliſters, provided they were long enough and often enough applied. In the inflammatory fevers, he has known theſe fomentations have little effect for the firſt hour, and yet ſucceeded afterwards. For internal medicine the bark was omitted for ſome time, but the patient was continued with an acidulated drink, *viz.* barley-water and vinegar; and treated alſo with camphire, *pulvis contrayeræ compoſitus*, and nitre, as was uſual in the beginning of the fever. If the delirium was of the low kind, a decoction of the bark and wine were the only remedies; for in no inſtance was the delirium perfectly removed till the time of the criſis. It muſt alſo be obſerved, that a delirium may ariſe in putrid fevers from two oppoſite errors; one from large and repeated bleedings, and the other from wine and the cordial medicines being taking too early. It appears therefore how nice the principles are that regard the cure; as neither a hot nor a cool regimen will anſwer with every patient, or in every ſtate of the diſeaſe.

If a diarrhœa came on in the decline of the fever, it was moderated, but not ſuppreſſed, by adding an opiate to the uſual medicines. For though the looſeneſs may be conſidered as critical; yet as the ſick were too low to bear evacuations, there was a neceſſity for reſtraining it in ſome meaſure; and it has often been obſerved, that when it has been treated in this manner, about the uſual time of the criſis, the patient has fallen into a gentle ſweat, which has carried off the diſeaſe. In the worſt caſes of this fever, and eſpecially when it coincides with the dyſentery, the ſtools are frequently bloody; in which dangerous ſtate, if any thing could be done, it was attempted by medicines of the ſame kind. In proportion to the putrid nature of the ſtools, opiates and aſtringents were uſed with the greater caution.

If the diſeaſe terminate in a ſuppuration upon one of the parotid glands (for the gland itſelf does not ſuppurate), the abſceſs was opened without waiting for a fluctuation, which might never happen; the pus being often here ſo viſcid, that after it was ripe the part felt nearly as hard as if the ſuppuration had not begun.

Almoſt every patient, after the fever, complained of want of reſt, frequently of a vertigo or confuſion of the head, of a continuation of the deafneſs, or of other ſymptoms commonly called *nervous*. An opiate was then given at night; and in the day ſome ſtrengthening medicines, ſuch as the bark and the elixir of vitriol. In theſe caſes, the bark was found not only to be the beſt ſtrengthener, but the ſureſt preſervative againſt a return of the diſeaſe. For this laſt intention the convaleſcent was ordered about three drachms a-day for ſix or ſeven days together; and afterwards, if he remained longer in the hoſpital, ſome ſmaller quantity daily. But if there was any appearance of a hectic fever from an inward abſceſs, the caſe was treated accordingly. Upon comparing ſome of the remaining ſymptoms of thoſe who recovered, with the condition of the brain in thoſe who died and were opened, Sir John Pringle was induced to think, that ſome part even of that ſubſtance might ſuppurate, and yet the perſon recover.

Sometimes the patient falls into an irregular intermittent; which, if not of a hectic nature from an internal abſceſs, may proceed from neglecting to clear the *primæ viæ*. For it is eaſy to conceive, that after a long fever of ſuch a putrid nature, often attended with langour of the bowels, the fæces may be ſo much accumulated, and ſo corrupted, as to occaſion new diſorders. In ſuch caſes, after proper evacuation by a purge, the bark was almoſt an infallible remedy.

The *Yellow* Fever.

Typhus cum flavedine cutis.

Typhus icteroides, *Sauv.* ſp. 7.

168 *Febris flava Indiæ Occidentalis, Warren.* Malignant fever of Barbadoes, *Hillary's* Diſeaſes of Barbadoes. *Lining* on the yellow fever of South Carolina, Edin. phyſ. and liter. Eſſays, vol. ii. *Mackittrick* de febre flava Indiæ Occidentalis, Edin. 1766.

Deſcription. This is one of the moſt fatal diſeaſes to which the inhabitants of warm climates are ſubject, and is the ſame with that called, from one of its worſt ſymptoms, the *black vomit*, which is ſo terribly deſtructive in ſome of the warm parts of America, particularly at Carthagena. According to Dr Hillary, the yellow or putrid fever moſt commonly ſeizes the patient at firſt with a faintneſs, then with a ſickneſs at ſtomach, accompanied moſtly with a giddineſs of the head; ſoon after with a ſlight chillneſs and horror, very rarely with a rigor, which is ſoon followed by a violent heat and high fever, attended with acute darting pains in the head and back. A fluſhing in the face, with an inflamed redneſs and a burning heat in the eyes, great anxiety and oppreſſion about the præcordia, are the pathognomonic ſigns of the diſtemper; eſpecially when attended with ſickneſs at ſtomach, violent retchings, and bilious yellow vomitings, with frequent ſighing. The pulſe is now generally very quick, high, ſoft, and ſometimes throbbing, but never hard: in ſome it is very quick, ſoft, low, and oppreſſed; the reſpiration quick, full, and ſometimes difficult; the ſkin very hot, and ſometimes dry, though more frequently moiſt. Blood taken from the patient, even at the very beginning of the diſeaſe, is often of an exceedingly florid red colour; much rarefied and thin, and without the leaſt appearance of ſize; and the craſſamentum, when it has ſtood till it is cold, will ſcarce cohere, but fluctuates; the ſerum is very yellow.

Moſt of the abovementioned ſymptoms continually increaſe, and are much aggravated; the retching and vomiting become almoſt inceſſant; the anxiety great, and ſighing frequent; great reſtleſneſs; continual toſſing; no eaſe in any poſture; little ſleep, and that diſturbed and uneaſy, and without any refreſhment to the ſick: and when they are fainting, they turn yellow about the face and neck, inſtead of turning pale; and as the fainting goes off, they recover their natural colour. Theſe ſymptoms generally continue to the third day, though ſometimes not longer than the firſt or ſecond, in others to the end of the fourth: the firſt ſhows the greater diſſolution of the blood, and the greater malignity of the diſeaſe; the laſt, the contrary; which

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which the improper manner of treating the diſeaſe ſometimes haſtens and increaſes, or the proper method retards. This may be called the firſt ſtadium of the diſeaſe, and generally ends on the third day.

Blood taken from the ſick on the ſecond or third day, is much more diſſolved, the ſerum more yellow, and the craſſamentum florid, looſe, ſcarce cohering, but undulates like ſizy water when ſhaken, and ſometimes has dark blackiſh ſpots on its ſurface, ſhowing a ſtrong gangreneſcent diatheſis.

About the third day, the pulſe, which was quick and full before, now generally ſinks greatly, and becomes very low: though ſometimes it remains very quick, yet in others it is not much quicker than when the patient is in health, but is always low; the vomiting becomes almoſt inceſſant if not ſo before, and the matter thrown up is black; the patient then becomes comatoſe, with interrupted deliria. The thirſt in ſome is very great, in others but little; the pulſe ſtill low and quick, attended with cold clammy ſweats, and ſometimes with deliquia. The eyes, which were inflamed and red before, and began to be of a more duſkiſh colour, now turn yellow; and this yellowneſs alſo ſoon after appears round the mouth, eyes, temples, and neck, and in a ſhort time diffuſes itſelf all over the body. But this yellowneſs is ſo far from being always an encouraging prognoſtic, as ſome would have it, that it moſt commonly proves a mortal ſymptom. Sometimes indeed, though ſeldom, this ſuffuſion of bile upon the ſurface has proved critical; but then it did not come on till the eighth or ninth day, nor appear till the coma and all the other bad ſymptoms began to abate; and then in proportion as the yellowneſs increaſes, all the bad ſymptoms decreaſe. But the caſe is moſt commonly quite the reverſe; eſpecially when the yellowneſs comes ſoon on: and then it is not only ſymptomatical, but uſhers in the moſt fatal ſymptoms of the diſeaſe, viz. a deep coma, a low, vermicular, and intermitting pulſe, great hæmorrhages from various parts of the body, a delirium with laborious and interrupted reſpiration, great anxiety, deep ſighing, reſtleſſneſs, a ſubſultus tendinum, coldneſs of the extreme parts firſt, and then all over the body, a faltering of the ſpeech, tremors, and convulſions, which are ſoon after followed by death. So that from the firſt appearance of the yellowneſs we may ſay the patient is in the laſt ſtage of the diſeaſe, whether it terminates in death or recovery.

It has been obſerved, that, in ſome ſtrong ſanguine conſtitutions, when the patients have not been bled to a ſufficient quantity in the beginning of the diſeaſe, the pulſe has continued full, ſtrong, and rapid, but never hard; the face fluſhed, eyes inflamed; the tongue dry, with great thirſt and heat, till the ſecond or laſt ſtage of the fever is come on, when the pulſe has ſuddenly ſunk, and death ſoon after enſued. Yet in others, who ſeemed to be of a plethoric habit, the tongue has been moiſt all along, though they have been delirious moſt of the time, and the heat of their ſkin and the ſtrength and quickneſs of their pulſe have continued, after the firſt ſtage of the diſeaſe was over, pretty near to that of their natural ſtate in health, till within a few hours of their death; and when they have had a coma on them, one who is not well acquainted with the nature of this diſeaſe would, from their pulſe, heat, breathing, and other ſymptoms, have taken them to be in a natural ſleep. Others, when the pulſe has begun to ſink, and the fatal period ſeemed to be juſt approaching, to the great ſurpriſe of all preſent have recovered their ſenſes, ſat up, and talked pretty cheerfully for an hour or two, and in the midſt of this ſeeming ſecurity have been ſuddenly ſeized with convulſions, which carried them off immediately.

Typhus.

In the latter ſtage of this fever, the blood is ſo attenuated and diſſolved, that we frequently ſee it flowing not only out of the noſe and mouth, but from the eyes, and even through the pores of the ſkin; alſo great quantities of black, half-baked, or half-mortified blood, are frequently voided both by vomiting and by ſtool, with great quantities of yellow and blackiſh putrid bile by the ſame paſſages; and the urine, which was before of a high icteritious colour, is now almoſt black, and is frequently mixed with a conſiderable quantity of half-diſſolved blood. The pulſe, which was much ſunk before, now becomes very low, unequal, and intermitting; the breathing difficult and laborious; and the anxiety inexpreſſible: an oppreſſion with a burning heat about the præcordia comes on, tho' the extremities are cold, and often covered with cold clammy ſweats: a conſtant delirium follows; and then a total loſs of the outward ſenſes as well as the judgment, with livid ſpots in many parts of the body, eſpecially about the præcordia; and ſometimes gangrenes in other parts of the body, which are very ſoon ſucceeded by death.

In a ſhort time after death, the body appears much more full of livid, large, mortified ſpots, particularly about the præcordia and hypochondres, eſpecially the right; which parts ſeem, even from the firſt ſeizure, to be the principal ſeat of this terrible diſeaſe; and, upon opening the bodies of thoſe who die of it, we generally find the gall-bladder and biliary ducts turgid, and filled with a putrid blackiſh bile; and the liver, ſtomach, and adjoining parts, full of livid or blackiſh mortified ſpots; and the whole corpſe ſoon putrifies after death, and can be kept but a few hours above ground.

Dr Lind is of opinion, that the remarkable diſſolution of the blood, the violent hæmorrhages, black vomit, and the other ſymptoms which characterize the yellow fever, are only accidental appearances in the common fever of the Weſt Indies; that they are to be eſteemed merely as adventitious, in the ſame manner as purple ſpots and bloody urine are in the ſmall-pox, or as an hiccough in the dyſentery: like theſe they only appear when the diſeaſe is attended with a high degree of malignity, and therefore always indicate great danger. This opinion, he thinks, is confirmed by an obſervation of Dr Wind's, that in 1750 the crew of a Dutch ſhip of war were diſtreſſed by the yellow fever, accompanied with the black vomit; but when the ſhip left the harbour, and changed the noxious land-air for one more healthy, the fever continued, but was not accompanied with the black vomit.

Diſeaſes ſimilar to this fever, Dr Lind informs us, may ariſe in any part of the world where the air is intenſely hot and unwholeſome; and therefore he treats as chimerical the notion of its being imported from one part of the world to another. An example of this happened at Cadiz in Spain, in the months of September and October 1764, when exceſſive heat, and want of rain for ſome months, gave riſe to violent, epidemic, bilious diſorders, reſembling thoſe of the Weſt Indies, of which 100 perſons often died in a day. At this time the winds blew principally from the ſouth, and after ſun-ſet there fell an unuſual and very heavy dew.

This diſeaſe began commonly with alternate ſlight chills and heats, nauſea, pains of the head, back, loins, and at the pit of the ſtomach. Theſe ſymptoms were often followed, in leſs than 24 hours, with violent retchings, and vomiting of a green or yellow bile, the ſmell of which was very offenſive. Some threw up an humour as black as ink, and died ſoon after in violent convulſions and in a cold ſweat. The pulſe was ſometimes ſunk, ſometimes quick, but often varying. After the firſt day, the ſurface of the body was generally either cold, or dry and parched. The head-ach and ſtupor often ended in a furious delirium, which quickly proved fatal. The dead bodies having been examined by order of the court of Madrid, the ſtomach, meſentery, and inteſtines, were found covered with gangrenous ſpots. The orifice of the ſtomach appeared to have been greatly affected, the ſpots upon it being ulcerated. The liver and lungs ſeemed to be putrid, both from their texture and colour. The ſtomach contained a quantity of an atrabilious liquor, which, when poured on the ground, produced a ſenſible efferveſcence; and, when mixed with ſpirit of vitriol, a violent ebullition enſued. The dead bodies ſo quickly turned putrid, that at the end of ſix hours their fetor was intolerable; and, in ſome of them, worms were found already lodged in the ſtomach. His Britannic majeſty's ſhip the Tweed being at that time in Cadiz bay, ſeveral of her men were taken ill when on ſhore, but by being carried on board, all of them recovered. Neither did the black vomit, or any other deadly ſymptom of that fever, make its appearance in any of the ſhips.

It has been a matter of much diſpute, whether the yellow fever is of an infectious nature or not. Some time ago it became an object of conſideration before the Right Hon. the Lords Commiſſioners of Trade and Plantations, where it was urged, among other reaſons, for not removing the ſeat of government and juſtice in the iſland of Jamaica from Spaniſh Town to Kingſton, that there was danger from Greenwich hoſpital, ſituated near Kingſton, of an infection from the yellow fever being frequently communicated to that town. On this affair a phyſician was conſulted, who had long practiſed in that iſland, and who gave it as his opinion, that from the yellow fever in that iſland there was no infection. This was the opinion not only of that gentleman, but of many others who had an opportunity of being well acquainted with this fever in Jamaica. Dr Lind, however, gives a remarkable inſtance of its being of an infectious nature.—A gentleman dying at Barbadoes of a yellow fever, his wearing apparel and linen, packed up in a cheſt, were ſent to his friends at Philadelphia; where, upon opening the cheſt, the family were taken ill; and the clothes being unluckily hung abroad to be aired, they preſently diffuſed the contagion of the yellow fever over the whole town, by which 200 perſons died. Theſe contradictions, Dr Lind thinks, can only be reconciled, by ſuppoſing the yellow fever in the Weſt Indies to be ſometimes of an infectious nature and ſometimes not.

In the deſcription of the ſame fever by Dr Lining, as it appears in South Carolina, there are ſeveral particulars conſiderably different from that by Dr Hillary. According to the former, people complained for a day or two before the attack, of a head-ach, pain in the loins and extremities, eſpecially in the knees and calves of the legs, loſs of appetite, debility, and a ſpontaneous laſſitude. Some, however, were ſeized ſuddenly, without any ſuch previous ſymptoms. After a chillineſs and horror, with which this diſeaſe generally invades, a fever ſucceeded. The pulſe was very frequent, till near the termination of the fever, and was generally full, hard, and conſequently ſtrong: in ſome, it was ſmall and hard; in others, ſoft and ſmall; but in all thoſe caſes, it frequently varied in its fullneſs and hardneſs. Towards the termination of the fever, the pulſe became ſmaller, harder, and leſs frequent. In ſome there was a remarkable throbbing in the carotids and in the hypochondria; in the latter of which it was ſometimes ſo great, that it cauſed a conſtant tremulous motion of the abdomen. The heat generally did not exceed 102 degrees of Fahrenheit's thermometer; in ſome it was leſs; it varied frequently, and was commonly nearly equal in all parts, the heat about the præcordia being ſeldom more intenſe than in the extremities when theſe were kept covered. In the firſt day of the diſeaſe, ſome had frequent returns of a ſenſe of chillineſs, though there was not any abatement of their heat. In a few, there happened ſo great a remiſſion of the heat for ſome hours, when at the ſame time the pulſe was ſoft and leſs frequent, and the ſkin ſo moiſt, that one from theſe circumſtances might reaſonably have hoped that the fever would only prove a remittent or intermittent. About the end of the ſecond day, the heat began to abate. The ſkin was ſometimes (though rarely) dry; but oftener, and indeed generally, it was moiſt, and diſpoſed to ſweat. On the firſt day, the ſweating was commonly profuſe and general; on the ſecond day, it was more moderate: but on both theſe, there happened frequent and ſhort remiſſions of the ſweatings; at which times the febrile heat increaſed, and the patient became more uneaſy. On the third day, the diſpoſition to ſweat was ſo much abated, that the ſkin was generally dry; only the forehead and backs of the hands continued moiſt. The reſpiration was by no means frequent or difficult; but was ſoon accelerated by motion, or the fatigue of drinking a cup of any liquid. The tongue was moiſt, rough, and white, even to its tip and edges. On the ſecond day, its middle in ſome was brown. On the third day, the whiteneſs and roughneſs of the tongue began to abate. The thirſt in very few was great. A nauſea, vomiting, or frequent retchings to vomit, eſpecially after the exhibition of either medicines or food, came on generally the third day, as the fever began to leſſen; or rather as the fulneſs of the pulſe, heat, and diſpoſition to ſweat, began to abate. Some indeed, but very few, on the firſt day, had a vomiting, either bilious or phlegmatic. Very few complained of anxiety or oppreſſion about the præcordia or hypochondria, nor was there any tenſion or hardneſs about the latter. On the firſt day they generally dozed much, but were afterwards very watchful. Reſtleſſneſs and almoſt continual jactations came on the ſecond day. A great deſpondency attended the ſick, and the ſtrength was greatly proſtrated from the firſt attack. The pain in the head, loins, &c. of which they had complained before the attack, were greatly increaſed, and in ſome the pain in the forehead was very acute and darting; but thoſe pains went generally off the ſecond day. The face was fluſhed; and the eyes were hot, inflamed, and unable to bear much light. On the firſt day, many of them at times were a little delirious, but afterwards not until the receſs of the fever. The blood ſaved at veneſection had not any inflammatory cruſt; in warm weather, it was florid like arterial blood, and continued in one ſoft homogeneous-like maſs, without any ſeparation of the ſerum after it was cold. When there was any ſeparation, the craſſamentum was of a very lax texture. The ſtools, after the firſt day, were fetid, inclined to a black colour, and were very rarely bilious, ſoft, or liquid, excepting when forced by art; for an obſtinate coſtiveneſs attended the febrile ſtate. The urine was diſcharged in a large quantity, was pale, ſometimes limpid, and rarely of a higher than a ſtraw colour, except when the weather was very warm, and then it was more ſaturated, of a deep colour, and diſcharged in ſmaller quantities. It had a large cloud, except when it was very pale or limpid; but more generally it had a copious white ſediment, even on the firſt day of the fever. On the ſecond day, the urine continued to be diſcharged very copiouſly; in ſome it was then turbid, and depoſited a more copious ſediment than on the firſt day: this ſediment was ſometimes of a browniſh colour; in which caſe it was generally followed by bloody urine, either about the end of the ſecond or beginning of the third day.—The colour and quantity of the urine, diſcharged in equal times, were remarkably variable, being now limpid, then of a deeper colour, now diſcharged in a larger, then in a ſmaller quantity; which could not be aſcribed to any change made either in the quantity or quality of the drink, &c.

The fever accompanied with thoſe ſymptoms terminated on the third day, or generally in leſs than 72 hours from the firſt attack, not by any aſſimilation or coction and excretion of the morbid matter: for if by the latter, there would have been ſome critical diſcharge by ſweat, urine, ſtool, or otherwiſe, none of which happened; and if by the former, nothing then would have remained but great debility. This fever, however, did not terminate in either of theſe ſalutary ways, excepting in ſome, who were happy enough to have the diſeaſe conquered in the beginning by proper evacuations, and by keeping up a plentiful ſweat, till the total ſolution of the fever, by proper mild diaphoretics and diluents. But thoſe who had not that good fortune, however tranquil things might appear at this period (as great debility, and a little yellowneſs in the white of the eyes, ſeemed then to be the chief complaint, excepting when the vomiting continued), yet the face of affairs was quickly changed: for this period was ſoon ſucceeded by the ſecond *ſtadium*; a ſtate, though without any fever, much more terrible than the firſt: the ſymptoms in which were the following. The pulſe, immediately after the receſs of the fever, was very little more frequent than in health, but hard and ſmall. However, though it continued ſmall, it became, ſoon afterwards, ſlower and very ſoft; and this ſoftneſs of the pulſe remained as long as the pulſe could be felt. In many, in this ſtage of the diſeaſe, the pulſe gradually ſubſided, until it became ſcarce perceptible; and this, notwithſtanding all the means uſed to ſupport and fill it; and when this was the caſe, the icteritious-like ſuffuſion, the vomiting, delirium, reſtleſneſs, &c. increaſed to a high degree. In ſome, the pulſe, after being exceedingly ſmall and ſcarce perceptible, recovered conſiderably its fullneſs; but that favourable appearance was generally of but ſhort continuance. The heat did not exceed the natural animal-heat; and when the pulſe ſubſided, the ſkin become cold, and the face, breaſt, and extremities acquired ſomewhat of a livid colour. The ſkin was dry when the weather was cold, but was moiſt and clammy when the weather was hot. The reſpiration was natural, or rather ſlow. The tongue was moiſt, and much cleaner than in the former ſtage; its tip and edges, as alſo the gums and lips, were of a more florid red colour than uſual. Very few complained of thirſt, though they had a great deſire for cold liquors. The vomiting or retching to vomit increaſed, and in ſome was ſo conſtant that neither medicines nor aliment of any kind were retained. Some vomited blood; others only what was laſt exhibited, mixed with phlegm; and others again had what is called the *black vomit* (A). The retching to vomit continued a longer or ſhorter time according to the ſtate of the pulſe; for as that became fuller, and the heat greater, the retching to vomit abated, and *è contra*. The inquietude was very obſtinate; and when they dozed, their ſlumbers were but ſhort and unrefreſhing. There were ſome who were drowſy; but theſe always awaked, after the ſhorteſt ſlumbers, with a great dejection of ſpirits and ſtrength. The

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(A) That which is called the *black vomit* at firſt ſight appears to be black; but on a more careful examination, it was obſerved that this colour proceeded from a great quantity of ſmall flakey black ſubſtances which floated in the liquor thrown up by vomiting; but the colour of this liquor was much the ſame with that which the patient had laſt drank, and was by no means black. Thoſe black flakey ſubſtances are the bile mixed with, or adhering to the mucus which lined the ſtomach. For, upon diſſection of thoſe who died of this diſeaſe, it was always obſerved that the mucus of the ſtomach was abraded, and the bile in the cyſtis was black and ſometimes very viſcid. In a lad who died of this diſeaſe in the beginning of the fourth day, and who was immediately opened, the bile was not only black, but had the conſiſtence of thick venice-turpentine, and was exceedingly tough. On the inſide of the ſtomach, there were ſeveral carbuncles or gangrenous ſpecks. And in all thoſe who were diſſected, and had died of this diſeaſe, the ſame appearances were not only always obſerved, but likewiſe the blood was very fluid, and the veſſels of the viſcera were much diſtended.

The jactations or reſtleſſneſs were ſurpriſing: it was frequently ſcarce poſſible to keep the patients in bed; though, at the ſame time, they did not complain of any anxiety or uneaſineſs; but if aſked how they did, the reply was, *Very well.* The debility was ſo great, that, if the patient was raiſed erect in the bed, or, in ſome, if the head was only raiſed from the pillow, while a cup of drink was given, the pulſe ſunk immediately, and became ſometimes ſo ſmall, that it could ſcarce be felt; at this time, they became cold, as in a horripilatio, but without the anſerine-like ſkin: their lips and ſkin, eſpecially about the neck, face, and extremities, together with their nails, acquired a livid colour. The delirium returned and increaſed; it was generally conſtant in thoſe whoſe pulſe was ſmall and ſubſiding. The inflammation of the tunica conjunctiva or white of the eyes increaſed much, but without pain. A yellowneſs in the white of the eyes, if it did not appear before in the febrile ſtate, became now very obſervable, and that icteritious-like colour was ſoon diffuſed over the whole ſurface of the body, and was continually acquiring a deeper ſaffron-like colour. In ſome indeed no yellowneſs was obſervable, excepting in the white of the eyes, until a little before death, when it increaſed very quickly, eſpecially about the breaſt and neck. There were many ſmall ſpecks, not raiſed above the ſkin, which appeared very thick in the breaſt and neck, but leſs ſo in the extremities, and were of a ſcarlet, purple, or livid colour. In women the menſtrua flowed, and ſometimes exceſſively, though not at their regular period.

There was ſuch a putrid diſſolution of the blood in this ſtadium of the diſeaſe, that, beſides the vomiting of blood formerly mentioned, and the bloody urine ſoon to be taken notice of, there were hæmorrhagies from the noſe, mouth, ears, eyes, and from the parts which were bliſtered with cantharides. Nay, in the year 1739 and 1745, there were one or two inſtances of an hæmorrhagy from the ſkin, without any apparent puncture or loſs of any part of the ſcarf-ſkin.

An obſtinate coſtiveneſs continued in ſome; in others, the ſtools were frequent and looſe; in ſome they were black, liquid, large, and greatly fatiguing; in others, when the ſtools were moderate, even though they were black, they gave great relief; in others, again, the ſtools nearly reſembled tar in ſmoothneſs, tenacity, colour, and conſiſtence.

The urine was diſcharged in a large quantity, in proportion to the drink retained by the patient: it was pale if the patient was not yellow; but if yellow, then it was of a deep ſaffron-colour: in either caſe, it had a ſediment, or at leaſt a large cloud, which remained at the bottom of the glaſs; in ſome it was very turbid; in others it was bloody: and the quantity of blood diſcharged with the urine bore always ſome proportion to the ſtate of the pulſe; when that became fuller, the quantity of blood in the urine was diminiſhed; when the pulſe ſubſided, the bloody urine increaſed, and even returned after it had ceaſed ſome days, ſoon after the pulſe became ſmaller. This ſtage of the diſeaſe continued ſometimes ſeven or eight days before the patient died.

When this ſtadium of the diſeaſe terminated in health, it was by a receſs or abatement of the vomiting, hæmorrhagies, delirium, inquietude, jactations, and icteritious-like ſuffuſion of the ſkin and white of the eyes; while, at the ſame time, the pulſe became fuller, and the patient gained ſtrength, which, after this diſeaſe, was very ſlowly. But when it terminated in death, thoſe ſymptoms not only continued, but ſooner or later increaſed in violence, and were ſucceeded with the following, which may be termed the third *ſtadium* of the diſeaſe, which quickly ended in death. The pulſe, though ſoft, became exceedingly ſmall and unequal; the extremities grew cold, clammy, and livid; the face and lips, in ſome, were fluſhed; in others they were of a livid colour; the livid ſpecks increaſed ſo faſt, that in ſome the whole breaſt and neck appeared livid; the heart palpitated ſtrongly; the heat about the præcordia increaſed much; the reſpiration became difficult, with frequent ſighing; the patient now became anxious, and extremely reſtleſs; the ſweat flowed from the face, neck, and breaſt; blood flowed from the mouth, or noſe, or ears, and in ſome from all thoſe parts at once; the deglutition became difficult; the hiccoughs and ſubſultus of the tendons came on, and were frequent; the patients trifled with their fingers, and picked the naps of the bed-clothes; they grew comatous, or were conſtantly delirious. In this terrible ſtate, ſome continued eight, ten, or twelve hours before they died, even after they had been ſo long ſpeechleſs, and without any perceptible pulſation of the arteries in the wriſts; whereas, in all other acute, diſeaſes, after the pulſe in the wriſts ceaſes, death follows immediately. When the diſeaſe was very acute, violent convulſions ſeized the unhappy patient, and quickly brought this ſtadium to its fatal end. After death, the livid blotches increaſed faſt, eſpecially about the face, breaſt, and neck, and the putrefaction, began very early, or rather increaſed very quickly.

This was the progreſs of this terrible diſeaſe through its ſeveral ſtadia. But in hot weather, and when the ſymptoms in the firſt ſtage were very violent, it paſſed through thoſe ſtages with ſuch precipitation that there was but little opportunity of diſtinguiſhing its different ſtadia, the whole tragedy having been finiſhed in leſs than 48 hours. It was remarkable, that, 1. The infection was increaſed by warm and leſſened by cold weather. 2. The ſymptoms in the ſeveral ſtadia were more or leſs violent, according to the heat or coolneſs of the weather. In hot days, the ſymptoms were not only more violent, but in thoſe who ſeemed in moderate weather to be on the recovery, or at leaſt in no danger, the ſymptoms were alſo greatly heightened, when the weather grew conſiderably warmer, as frequently to become fatal. In cool days, the ſymptoms were not only milder, but many who were apparently in great danger in hot days were ſaved from the very jaws of death by the weather becoming happily cooler. 3. The diſeaſe was generally more fatal to thoſe who lay in ſmall chambers not conveniently ſituated for the admiſſion of freſh air, to thoſe of an athletic and full habit, to ſtrangers who were natives of a cold climate, to thoſe who had the greateſt dread of it, and to thoſe who before the attack of the diſeaſe had overheated themſelves by exerciſe in the ſun, or by exceſſive drinking of ſtrong liquors; either of which indeed ſeemed to render the body more ſuſceptible of the infection. Laſtly, the diſeaſe proved moſt certainly fatal to valetudinarians, or to thoſe who had been weakened by any previous diſeaſe.

Although from the deſcription which has now been given of the yellow fever, it may appear to be in many particulars very different from the remittent fever of warm climates; yet it is the opinion of many late writers of great accuracy, particularly of Dr John Hunter in his Obſervations on the Diſeaſes of the Army in Jamaica, that it is to be conſidered only as a more dangerous form of the ſame diſeaſe. And there can be no doubt that the remittent fever not only appears in different ſeaſons and ſituations with very different degrees of ſeverity; but alſo that while the remittent fever prevails in its uſual form in the Weſt India iſlands, ſome individuals, particularly thoſe who are newly arrived, will be affected with very remarkable yellowneſs, as well as bilious and black vomitings.

Cauſes of, and perſons ſubject to, this diſeaſe. The yellow fever attacks principally Europeans, eſpecially thoſe who have but lately arrived in the hot climates. Negroes are entirely exempt from it, though the mulattoes and tawnies are as liable to be ſeized with it as the whites themſelves. The cauſe of the diſeaſe ſeems to be a particular kind of contagion; but Dr Lind ſeems to be of opinion, that the immediate cauſe of the ſymptoms is a diſpoſition in the glutinous part of the blood to ſeparate from the others, and to become purulent. In ſome perſons who have been bled in the yellow fever, the blood hath been obſerved prodigiouſly viſcid; the craſſamentum covered with a yellow gluten half an inch in thickneſs, and impenetrable to the finger unleſs cut by the nail; the ſerum being at the ſame time of the conſiſtence of a thin ſyrup, and of a deep yellow tinge. This ſerum taſted bitter, and was taken for a compoſition of ſoot. The appearances on diſſection, with his concluſion from them, we ſhall give in his own words: "In a man who died on the eleventh day of a yellow fever, whoſe body emitted no bad ſmell 36 hours after death, and was ſtill yellow, I found all the bowels of the abdomen ſound; the liver and ſpleen were remarkably ſo: as alſo the ſtomach and inteſtines. There was no ſuffuſion of the bile either in the inteſtines or ſtomach. The gall-bladder, of the natural ſize, contained the uſual quantity of bile, ſomewhat thicker than common, and grumous (B).

"Upon examining further, this diſeaſe was found to have lain wholly on the left ſide, where, within the breaſt, was found near a quart of yellowiſh water, in which were many large flakes of yellowiſh gluten, appearing, by compariſon, preciſely the ſame with the thick pellicle which had covered the blood taken from his arm. Theſe flakes bore in ſeveral places a reſemblance to a membranous ſubſtance beginning to be converted into a purulent jelly. The pleura, both on its inſide and outſide, as alſo its continuation, the inveſting membrane of the lungs (which in ſome parts was greatly thickened), were covered with cakes of this gluten, hanging in ſome places looſely, in others adhering more ſtrongly; and all in different ſtates of yellow or purulent corruption. The right cavity of the breaſt, and all the other parts of his body, were found entirely free from diſeaſe.

"His complaints had been chiefly in his breaſt; and a ſmall quantity of blood, taken from him two days before his death, was covered with an impenetrable, yellow, thick gluten; the red portion below it being quite looſe.

"In thoſe fevers, I have alſo ſeen the diſeaſe entirely confined to the heart and pericardium. In one who died the tenth day of the fever, without having been yellow, a quantity of pus and purulent cruſts were found mixed with the water of the pericardium. The heart in different places was excoriated; and, together with the inſide of the pericardium, was lined with a thick membranous cake, ſimilar to that already mentioned on the lungs and pleura. In ſome places this cake had a purulent, in others a gelatinous, appearance, exactly reſembling the coagulum of the blood. His complaints had been, a great oppreſſion on the breaſt, and an extreme difficulty of breathing. In a third perſon, who died on the thirteenth day of the fever, above two quarts of pus and purulent jelly were found in the cavity of the belly. The ſource of ſuch an extraordinary quantity of matter was not from any preceding inflammation, nor any impoſthume, that we could diſcover; but from innumerable ulcerations on the ſurface of the inteſtines, omentum, meſentery, and peritoneum. Neither did thoſe ulcerations (or excoriations, as they rather appeared in ſeveral places) ſeem to be the primary fountains of the matter, but to have been occaſioned by its acrimony.

"This purulent appearance ſeems to ariſe merely from an extravaſation of one of the component parts of the blood, the gluten or coagulable lymph. Blood taken from perſons in a fever, and frequently even from perſons in perfect health, after ſtanding in a clean veſſel for a ſhort time, commonly ſeparates into three diſtinct portions; *viz.* the ſerum, or water of the blood, the red concreted maſs, and a viſcid pellicle termed the *ſize*, which ſpreads itſelf on the top of the red concretion. Some time ago, when making experiments with the blood taken from perſons in the ſcurvy, I was ſurpriſed to find it often covered with that ſizy cruſt. This induced me to extend my experiments to large quantities of blood from different ſubjects, which I had opportunities of inſpecting at once in ſo large an hoſpital. For this purpoſe I one morning ordered ten patients in the ſcurvy to be bled, taking two ounces from each. A larger quantity was taken, for its inſpection, from two men in health. That day I had occaſion to preſcribe bleeding to a woman in labour, two hours before her delivery; to a girl of ſixteen years of age afflicted with a lunacy proceeding from the chloroſis; to three patients in the rheumatiſm; and to a perſon labouring under an obſtruction of the liver.

(B) In others who died in this yellow ſtate, the bile in the gall-bladder was found of a thick ropy conſiſtence like pitch, but the liver never appeared in the leaſt affected. Dr Lind at firſt in ſeveral bodies opened the head only; but afterwards judged that all the cavities ought to be inſpected.

“ From a nice compariſon, and an examination of the different blood, I found in general, that the more ſize there was on the top, and the thicker and more viſcid this white pellicle ſhowed itſelf, the concretion below it was of a more looſe coherence. This was not ſo obſervable when only ſome ſlight white ſtreaks appeared on the top. But when much ſize had ſeparated itſelf, the red maſs became very ſoft at the bottom of the veſſel, and leſs compact in its different parts, in proportion to their diſtance from the ſurface, towards which this whitiſh portion had aſcended.

“ From this and from other experiments it appears, that this cruſt or pellicle is the natural gluten or cement of the blood (called by ſome the *coagulable lymph*), which becomes ſtrongly diſpoſed, in certain circumſtances and diſeaſes, to ſeparate itſelf. And whereas the ſerum and red concretion are eaſily incorporated together, it will be found, that this glue, after its ſeparation, becomes immiſcible with either. We have, by gentle drying, converted it into a perfectly tough elaſtic membrane; and, by the means of a ſmall portion of the red maſs being left adhering to it, into a ſubſtance reſembling muſcular fleſh; and it is capable of undergoing various changes into corruption, in the ſame manner as either of theſe.

“ Now I can ſee no reaſon why this gluten, in its morbid ſtate, may not ſeparate itſelf from the circulating blood, and be depoſited in the cavities of the body, as readily as the ſerum does in dropſies; the former having always a leſs diſpoſition than the latter to incorporate with the maſs.

“ In diſſecting perſons who died of fevers in London and Minorca, and where no infection was ſuſpected, appearances ſimilar to theſe have alſo fallen under the inſpection of thoſe accurate anatomiſts Drs Hunter and Cleghorn. Hence it may be preſumed very difficult to diſtinguiſh fevers that are produced by infection, from ſome others. I cannot, however, be induced to think, as thoſe gentlemen ſeem to do, that theſe preternatural ſubſtances which were found in the cavities of the body are the conſequence, but rather that they are the cauſe of the inflammation and excoriations. I believe theſe ſubſtances to be at firſt diſeaſed extravaſated gluten, and conjecture their different ſtates greatly to depend upon the different times at which they were depoſited.

“ I have remarked in a variety of dead bodies, three different kinds of extravaſation; theſe occurred in ſuch as had died of the ſcurvy, of the conſumption, and of fevers. In the former of thoſe diſeaſes, red coagulated blood is found extravaſated in almoſt all parts of the body, not only into the tela celluloſa, but into the bellies of the muſcles, particularly of the legs and thighs, which often become quite ſtuffed and even diſtorted with large grumous maſſes. The inteſtines and meſentery are often ſpotted alſo with extravaſated blood; and I have ſeen large ecchymoſes on the ſtomach. Theſe appearances at firſt ſight reſembled ſo many diſtinct mortifications; and by this appearance ſome anatomiſts have been deceived; but, upon a nice examination, the texture, of the parts is found to be ſound and firm. There is likewiſe, in that diſeaſe, ſometimes, an extravaſation of water, chiefly collected in, and always when in the legs confined to, the tela celluloſa.

“ But whereas, in the limbs of ſcorbutic perſons, it is extremely difficult to make a good diſſection by reaſon of ſuch quantities of extravaſated blood that every where obſtruct the operator; ſo, on the contrary, the lower extremities of thoſe who have died conſumptive, with ſwelled legs, are of all other ſubjects, in the beſt ſtate to afford a ſatisfactory view of the muſcles. The water incloſed in their legs having inſinuated itſelf, by paſſing the tela celluloſa, into the ſpaces between the muſcles, the muſcles are eaſily ſeparated from each other; and their ſeveral origins and inſertions may be diſtinctly traced by means of their having been cleanſed and waſhed by the water in the inveſting cellular membrane. Thus there are extravaſations of three ſorts; *viz.* firſt, the grumous maſs in the ſcurvy; and this I have often remarked where no ſerum was obſerved. Secondly, the ſerum alone in anaſarcous ſwellings. The third and laſt is what was taken notice of in thoſe who died of fevers, being the gluten of the blood, accompanied for the moſt part with ſome ſerum; both of them altogether confined in the large cavities of the body.

“ I conjecture, that in thoſe fevers there is always an ulcerous or purulent diſpoſition in the blood; and that this gluten or coagulable lymph is greatly diſeaſed. I have frequently ſeen it have a true purulent appearance ſoon after it was drawn off, when the patient ſeemed not very ill.

“ And I further conjecture, that the miſchief often lies within the breaſt; as alſo that the great benefit derived from the very early application of bliſters, in a great meaſure flows from ſo many ulcerations and vents being timely provided for the free diſcharge of thoſe purulent and tainted particles from the body.

“ If an infection depends, as many have imagined, on the admiſſion of certain foreign particles into the blood, this gluten ſeems to be its more immediate ſeat, and to be primarily affected by it; and a diſcharge of this, as though by waſhing thoſe particles out of the body, tends in a great meaſure to remove the diſeaſe.

“ It is an obſervation of the beſt practical writers, that iſſues and ſetons are moſt excellent preſervatives againſt receiving an infection, nay, even that of the plague itſelf. And indeed a ſuppuration and plentiful diſcharge from a proper ulcer, whether produced by nature or by art, ſeems to open a channel the beſt appropriated for an exit out of the body to ſome of the moſt malignant poiſons. Thus the moſt favourable criſis in the plague, and in moſt peſtilential fevers, happens when nature excites tumors kindly ſuppurating in the groin or arm-pits, by whoſe beneficial and plentiful diſcharge the deadly poiſon is expelled from the conſtitution.

“ I have obſerved it to be amongſt the moſt certain characteriſtics of the worſt fevers, that the bliſters either do not riſe and fill, or diſcharge ſuch yellow, greeniſh, fetid, and highly offenſive ſtuff, that even experienced nurſes could give a pretty certain conjecture from the bliſters, of the different degrees of malignity in the fever. We have more than once endeavoured to conceal the bad ſtate of ſome patients in the hoſpital; but a diſcovery was always made of their condition in the waſh-houſe, from the linen ſent there ſtained with the diſcharges from the bliſtered parts.

And inded a careful inſpection of the ſtate and diſcharge from the bliſters, together with their effects furniſhes us, in thoſe diſeaſes, with ſome of the moſt certain diagnoſtics of their nature and prognoſtics of their event."

Prognoſis. This diſtemper, where it attacks with violence, is generally fatal; the prognoſis therefore muſt be commonly unfavourable, and always uncertain; neither can any thing more be ſaid on this ſubject, than that an abatement of the ſymptoms already enumerated affords a favourable prognoſtic, and an increaſe of them the contrary.

Cure. The cure of this terrible diſeaſe, according to Dr Hillary, is very eaſy and ſimple. His indications are, 1. To moderate the too great and rapid motion of the fluids, and abate the too great heat and violence of the fever in the two firſt days of the diſeaſe, as much and as ſafely as we can. 2. To evacuate and carry out of the body as much of the putrid bile and other humours, and as expeditiouſly and ſafely as poſſible. 3. To put a ſtop to the putreſcent diſpoſition of the fluids, and to prevent the gangrenes from coming on, by ſuitable antiſeptics.

The firſt indication is anſwered by bleeding, which, in the firſt ſtage of this fever, is abſolutely neceſſary in ſome degree: the quantity to be taken away muſt be determined by the age and ſtrength of the patients, the degree of plethora, fullneſs of the pulſe, &c. When called in at the beginning, he orders 12, 14, 16, 18, or 20 ounces of blood to be taken away on the firſt or ſecond day: and if the patient's pulſe riſe after the firſt bleeding, or if the fever ſtill continue high and the pulſe full, he repeats the bleeding once on the days above mentioned. But bleeding a third time is ſeldom or never required; neither is bleeding on the third day almoſt ever neceſſary; and when it is performed on that day, it ought to be done with the greateſt caution and judgment; neither ſhould a vein be opened after the third day in this fever, unleſs ſome very extraordinary ſymptoms and circumſtances require it; which ſeldom or never happen. On that day, indeed, the pulſe generally ſinks, and the blood is in ſuch a diſſolved ſtate, that bleeding muſt be accounted highly pernicious. Nevertheleſs, it is indiſpenſably neceſſary in the beginning of the diſtemper; and if omitted at that time, the violent heat and motion of the blood increaſe the putreſcence of the humours to ſuch a degree as to bring on the fatal conſequences much ſooner than would otherwiſe have happened.

After bleeding, we come to the ſecond indication of cure, namely, to evacuate as much of the bilious and putrid humours as ſoon and as ſafely as we can. The great irritation of the ſtomach, by the putrid bilious humours conſtantly attending this fever, with almoſt continual retchings and violent vomitings, ſeem to indicate the giving of an emetic: but the ſtomach is always obſerved to be ſo violently ſtimulated and irritated and moſt commonly inflamed by the acrimony of the putreſcent bile, that any emetic, even the moſt mild and gentle, given in the ſmalleſt doſe, brings on an inceſſant vomiting, which continues, in ſpite of all remedies, till a mortification and death enſue. Inſtead of this, it is proper to give large draughts of warm water, which, without any additional ſtimulus to the coats of the ſtomach, evacuates its acrid and putrid contents, commonly with great relief to the patient: the warm water alſo acts as an emollient fotus to the inflamed coats of the ſtomach; and thus abates the inflammation, and prevents the gangrene and mortification from coming on.

After the patient has by this means vomited ſeven or eight times or oftener, and diſcharged a great quantity of yellow and blackiſh bilious matter as they often do, a grain or a grain and a half of thebaic extract is given in order to procure ſome reſpite from the violent retching, vomiting, and anxiety. The perſon is deſired to take nothing into his ſtomach for two hours after this, by which means it is ſeldom or never rejected; and thus all the ſymptoms are conſiderably abated, the retching and vomiting either totally ceaſe or are very much leſſened, ſo that medicines may now be exhibited which the ſtomach would not have retained before. Theſe are cooling acid juleps, or other antiſeptic remedies; but neither nitre nor any of its preparations will commonly be found to ſtay on the ſtomach; nor are the nitrous medicines, or even the common anti-emetic draughts, proper to be given in this diſeaſe, even though they ſhould agree with the ſtomach, on account of their attenuating property.

If the patient has not a ſtool or two after drinking the warm water and vomiting, it is neceſſary to give a gentle purging clyſter: and when ſix or eight hours reſt have been obtained, a gentle antiphlogiſtic and antiſeptic purge, in order to evacuate by ſtool as much of the bilious matter as we poſſibly can. Or if the patient has a purging before, which ſometimes though very rarely happens, a doſe of toaſted rhubarb is given and an antiſeptic anodyne after it has operated, to abate and check the too great purging, but not to ſtop it, as this evacuation has been always obſerved to be of ſervice, provided it be not too violent.

After this indication is completely anſwered, the next is to exhibit ſuch proper antiſeptic medicines as may ſtop the putreſcent diſpoſition of the fluids. Here the Peruvian bark would ſeem to be the moſt proper remedy, but unluckily the ſtomachs of the patients in this diſeaſe are ſo much irritated, and ſo apt to reject every thing, that the bark cannot be retained in any form whatever. In this caſe Dr Percival recommends columbo-root, the infuſion of which is found to be a powerful antiemetic and antiputreſcent medicine, and might perhaps ſo far alter the ſtate of the ſtomach as to make it bear the bark. Dr Hillary, however, who was ignorant of the virtues of columbo, ſubſtituted the *radix ſerpentariæ Virginianæ* with ſucceſs. A ſlight infuſion of this root not only ſat eaſily on the ſtomach of the patients, but moderately raiſed the pulſe and fever, both of which are now too low. The following receipt was found the moſt agreeable and efficacious.

R Rad. ſerpent. Virginian. ʒii.
Croc. Ang. ʒſs. M. et infunde vaſe clauſo in aq bul. q. per horam unam ut col. ʒvi. Adde aq. menth. ſimp. ʒii. Vin. Maderienſ. ℥iv. Syr. croc. vel ſyr. e mecon. ℥i. Elix. vitriol. acid. q. ſ. ad grat. acidior. ſapor. Exhibe cochlearia duo vel tria ſingulis horis vel bihoris, vel ſaepius pro re nata.

By the uſe of this medicine, and ſoft light nouriſhment taken in ſmall quantities, the pulſe is uſually kept

Febres.

up and the diſtemper goes off. But if, after taking this a little while, we find that the pulſe does not riſe, but on the contrary that a coldneſs of the extreme parts comes on, the medicines muſt be made more warming, by increaſing the quantity of the ſnake-root and ſaffron, or by adding *vinum croceum*, *confectio cardiaca*, or the like, but not by the uſe of volatil ſpirits and ſalts, which hurt by their ſtimulating and diſſolving qualities. Bliſters our author reprobates in the ſtrongeſt terms, and affirms that he has ſeen the place where a bliſter was applied turned perfectly black and ſphacelated; ſo that if the ſpine and end of the ribs had not hindered, a large ſquare paſſage would have been opened into the cavity of the thorax, had the patient lived a few hours after it.

At the ſame time that the ſtrength of the patient is kept up by the medicines abovementioned, or by others ſimilar, he gave repeated gentle purgatives every ſecond or third day, and ſometimes, when the ſymptoms were very urgent, every day, for four or five days ſucceſſively. But if proper methods be taken in the beginning of the diſeaſe, it is ſeldom that ſuch a repetition of purging is neceſſary; and the Doctor gives the following remarkable inſtance of the efficacy of this method of treating the diſeaſe: "A young man about 24 years of age, ſurgeon to a Guinea ſhip, was brought into a houſe where I was viſiting a patient; he was of a ſanguine robuſt conſtitution, and a lover of ſpirituous liquors, and had been drunk three days and nights ſucceſſively, and in that condition had run ſeveral races on the hot ſea-ſhore, near noon, with the ſailors, in the heat of the ſun; and to complete his folly, lay the laſt night, after that exerciſe, in the open air under a tamarind-tree all the night, where he was ſeized in the morning with all the ſymptoms of this fever, in the moſt violent manner that I have ever ſeen any one. In this condition he was brought to the houſe where I was: his retching and vomiting were ſo inceſſant, that he could not get time to ſay yes, or no, to the queſtions which I aſked, without waiting ſome time for it, each time; his eyes were red and inflamed, attended with a burning heat, as uſual in the beginning of this fever; and he had all the other ſymptoms which attend the firſt attack of this fever in the moſt violent manner, which I need not repeat. I ordered ℥xvi. of blood to be taken from him, which was very florid, thin, and much diſſolved; and then directed him to drink warm water freely, and to vomit eight or ten times; and after that to take *extract Thebaic.* gr. jſs. and take nothing for two hours after it. But I being gone, and he finding that he vomited with more eaſe, leſs ſickneſs and retching, with the warm water, than he did before, and being much alarmed at his having this fever, he drank three gallons of the water, and brought up great quantities of yellow and blackiſh bilious matter with it, and waſhed his ſtomach effectually. He then took the *extr. thebaic.* and ſlept three or four hours after it; and the vomiting ceaſed: he took ſome panada, and four hours after that the purge of manna and tamarinds, &c. which gave him eight ſtools, and carried a good deal more of the putrid bilious matter off downwards; and got ſome reſt after it: he then took of an antiſeptic julep often, and light nouriſhment, a little acid, at the intervals; and repeated the purge on the third day, as directed. Being called out of the town, I did not ſee him till the fourth morning after; he ſaid that he had followed my directions; and I found him free from the fever and all its ſymptoms, but weak and low, and his ſkin a little yellow, but much leſs ſo than uſual, unleſs when the bilious matter is thus carried off. I ordered him to take *elix. vitrioli acid. gut.* lx. three or four times a-day for a few days, in an infuſion of mint-leaves with a little ſnake-root, made as tea; which he did, and ſoon recovered perfectly well in ſeven or eight days time.

Typhus.

"This patient being ſeized in ſo violent a manner, and recovering in ſo ſhort a time, and ſo near to the rule which the elegant Celſus recommends *citò, tutò, et jucundè*, not only confirmed the above manner of reaſoning on the cauſe and nature of this diſeaſe to be right, but made me determine to follow the ſame method as near as I poſſibly could ever ſince, and I muſt add, with the ſame good ſucceſs alſo, when I am called ſo early in the diſeaſe that I can ſtrictly purſue it: which is too ſeldom the caſe; for in general the phyſician is not called till the fourth or fifth day, or after, when the putrid acrid bilious matter is a great part of it carried into the blood, which it has ſo diſſolved and brought its whole maſs into a colliquated, putrid, gangreneſcent ſtate, that the beſt of methods, and the moſt efficacious medicines, however judiciouſly timed and applied, are precarious and uncertain; or ſometimes it is ſo far advanced, that the ableſt phyſician can do no more than tell the relations of the ſick that it is too late, and that they can live but a few hours: for I know no diſeaſe in which the recovery of the patient ſo much depends upon the right or wrong method of treating it, at the very firſt attack or beginning of the diſeaſe, as this fever does: for by thus diſcharging and carrying the putrid, acrimonious, bilious matter, out of the body before much of it is carried into the blood, not only moſt of the bad ſymptoms which attend the ſecond ſtate of the fever are prevented from coming on, but the hæmorrhagies, and the yellowneſs of the ſkin, &c. alſo, and the fever ſoon taken off too; for I have never ſeen any hæmorrhagy come on, and but little yellowneſs, or in ſome none, when they were thus treated.

"And when the laſt ſtage of this fever is come on before we are called in, provided that it is not at the very latter end of it, I have always found that this method of gentle purging, whenever the beforementioned ſymptoms indicate it, and a liberal uſe of the antiſeptic medicines in the intervals, has been ſo ſucceſsful, that I have ſeen but two patients that have died in this fever during the eight years paſt in which I treated it in this manner; and one of them was ſo weak that he could not take a ſpoonful of any thing, and ſo near his end that he died about two hours after without taking any medicine; and the other killed himſelf by drinking a gallon of cold water in leſs than three hours time (after taking half an ounce of manna in the morning), which ſtruck ſuch a coldneſs into his whole body that he died; though I have viſited ſeveral every year, and in ſome years a great many: therefore I take the liberty of recommending this method to others, and wiſh it to be as ſucceſsful to all."

To the genus of *typhus* alſo belong all thoſe fevers attended with very profuſe and debilitating ſweats, and which have ſometimes, not without good reaſon, been accounted plagues; ſuch as the Engliſh ſweating ſickneſs, Miliaris ſudatoria, *Sauv.* ſp. 5. Ephemera ſudatoria, *Sauv.* ſp. 7. Ephemera Britannica, *Caius de ephem. Britann.*

169 Genus VI. SYNOCHUS.

Synochus *Shauv.* gen. 81. *Lin.* 13.
Lenta *Lin.* 14.
Phrenitis *Vog.* 18.

Febris continua putrida *Boerh.* 730.

This is a contagious diſtemper, being a complication of a Synocha and Typhus; for the diſcription and cure of which, we muſt of conſequence refer to what hath been already ſaid concerning theſe diſeaſes.

The *Hectic* Fever.

170 Hectica, *Sauv.* gen. 83. *Lin.* 24. *Vog.* 80. *Sag.* 684.

This diſeaſe is reckoned by Dr Cullen to be merely ſymptomatic; as indeed ſeems very probable, ſince it very generally accompanies abſorptions of pus into the blood from internal ſuppurations, or indeed from ſuch as are external, provided they be very large or of a bad kind.

Deſcription. The beſt, indeed the only proper, deſcription of this diſorder we have is that by Dr Heberden. According to him, the appearance of the hectic fever is not unlike that of the genuine intermittent; from which, however, the diſeaſe is very different in its nature, while at the ſame time it is much more dangerous. In the true intermittent, the three ſtages of cold, heat, and ſweat, are far more diſtinctly marked, the whole fit is much longer, the period which it obſerves is more conſtant and regular, and the intermiſſions are more perfect, than in the hectic fever. For in the latter, even in the cleareſt remiſſion, there is uſually a feveriſh quickneſs perceptible in the pulſe, which ſeldom fails to exceed the utmoſt limit of a healthy one by at leaſt 10 ſtrokes in minute.

The chillneſs of the hectic fever is ſometimes ſucceeded by heat, and ſometimes immediately by a ſweat without any intermediate ſtate of heat. The heat will ſometimes come on without any remarkable chillneſs preceding; and the chillneſs has been obſerved to go off without being followed either by heat or ſweat. The duration of theſe ſtages is ſeldom the ſame for three fits together; and as it is not uncommon for one of them to be wanting, the length of the whole fit muſt vary much more than in the true intermittent: but in general it is much much ſhorter.

A patient ſubjected to hectic fever is little or nothing relieved by the coming on of the ſweat; but is often as anxious and reſtleſs under it as during the chillneſs or heat. When the ſweat is over, the fever will ſometimes continue; and in the middle of the fever the chillneſs will return; which is a moſt certain mark of this diſeaſe.

The hectic fever will return with great exactneſs, like an intermittent, for two or perhaps three fits; but Dr Heberden informs us, that he does not remember ever to have known it to keep the ſame period for four fits ſucceſſively. The paroxyſm will now and then keep off for 10 or 12 days; and at other times, eſpecially when the patient is very ill, it will return ſo frequently on the ſame day, that the chillneſs of a new fit will follow immediately the ſweat of the former. It is not unuſual to have many threatenings of a ſhivering in the ſame day; and ſome degree of drowſineſs is apt to attend the ceſſation of a fit.

The urine in a true intermittent is clear in the fits and turbid in the intervals; but in the hectic fever it is liable to all kinds of irregularity. It will be equally clear or turbid in both ſtages; or turbid in the fits and clear in the intervals; and ſometimes it will be, as in a true intermittent, clear during the fever, and thick at the going off.

Hectic patients often complain of pains like thoſe of the rheumatiſm, which either affect by turns almoſt every part of the body, or elſe return conſtantly to the ſame part; which is often at a great diſtance from the ſeat of the principal diſorder, and, as far as is known, without any peculiar connection with it. Thoſe pains are ſo violent in ſome patients, as to require a large quantity of opium. As far as Dr Heberden has obſerved, they are moſt common, where the hectic ariſes from ſome ulcer open to the external air, as in cancers of the face, breaſt, &c. Joined with this fever, and ariſing probably from one common cauſe, he has been ſurpriſed to ſee ſwellings of the limbs, neck, or trunk of the body, riſe up almoſt in an inſtant, as if the part was all at once grown fatter. Theſe ſwellings are not painful, hard, or diſcoloured, and they continue for ſeveral hours.

Dr Heberden has ſeen this fever attack thoſe who ſeemed in tolerable health, in a ſudden and violent manner, like a common inflammatory one; and like that, alſo, in a very ſhort time bring them into imminent danger of their lives; after which it has begun to abate, and to afford hopes of a perfect recovery. But though the danger might be over for the preſent, and but little of a fever remain; yet that little has ſoon demonſtrated, that it was kept up by ſome great miſchief within, and, proving unconquerable by any remedies, has gradually undermined the health of the patient, and never ceaſed except with his life. This manner of its beginning, however, is extraordinary. It much oftener diſſembles its ſtrength at firſt; and creeps on ſo ſlowly, that the ſubjects of it, though they be not perfectly well, yet for ſome months hardly think themſelves ill; complaining only of being ſooner tired with exerciſe than uſual, of want of appetite, and of falling away. But gentle as the ſymptoms may ſeem, if the pulſe be quicker than ordinary, ſo as to have the artery to beat 90 times and perhaps 120 times in a minute, there is the greateſt reaſon to be apprehenſive of the event. In no diſorder, perhaps, is the pulſe of more uſe to guide our judgment than in the hectic fever: yet even here we muſt be upon our guard, and not truſt entirely to this criterion; for one in about twenty patients, with all the worſt ſigns of decay from ſome incurable cauſe, which irreſiſtibly goes on to deſtroy his life, will ſhow not the ſmalleſt degree of quickneſs, nor any other irregularity of the pulſe, to the day of his death.

Cauſes, &c. This fever will ſupervene whenever there is a great collection of matter formed in any part of the body; but it more particularly attends upon the inflammation of a ſcirrhous gland, and even upon one that is ſlight and only juſt beginning; the fever growing worſe in proportion as the gland becomes more inflamed, ulcered, or gangrenous. And ſuch is the lingering nature of thoſe glandular diſorders, that the firſt of thoſe ſtages will continue for many months, and the ſecond for ſome years.

If this ſcirrhous inflammation be external, or in the lungs, or ſome of the abdominal viſcera, where the diſturbance of their functions plainly points out the ſeat of the diſorder, no doubt can be entertained concerning the cauſe of the fever. But if the part affected be not obvious to the ſenſes, and its preciſe functions be not known, the hectic, which is there only part of the train of another diſeaſe, may be miſtaken for the primary or only one.

Lying-in women, on account of the violence ſuſtained in delivery, generally die when affected with this fever. Women of the age of near 50 and upwards are particularly liable to it. For, upon the ceſſation of their natural diſcharge, the glands of the breaſts, ovaries, or womb, too commonly begin to grow ſcirrhous, and proceed to be cancerous. Not only theſe, but the glandular parts of all the abdominal viſcera, are diſpoſed to be affected at this particular time, and to become the ſeats of incurable diſorders.

The injuries done to the ſtomach and liver by hard drinking are attended with ſimilar ſymptoms, and terminate in the ſame manner.

Dr Heberden obſerves, that the ſlighteſt wound by a fine pointed inſtrument is known upon ſome occaſions to bring on the greateſt diſturbances, and the moſt alarming ſymptoms, nay even death itſelf. For not only the wounded part will ſwell and be painful, but by turns almoſt every part of the body; and very diſtant parts have been known to come even to ſuppuration. Theſe ſymptoms are conſtantly accompanied with this irregular intermittent, which laſts as long as any of them remain.

Prognoſis. This anomalous fever is never leſs dangerous than when it belongs to a kindly ſuppuration, into which all the diſeaſed parts are melted down, and for which there is a proper outlet.

The ſymptoms and danger from ſome ſmall punctures, with their concomitant fever, moſt frequently give way in a few days; though in ſome perſons they have continued for two or three months, and in others have proved fatal.

The inflammation of internal ſcirrhous glands, or of thoſe in the breaſts, ſometimes goes off, and the fever, which depended upon it, ceaſes; but it much oftener happens, that it proceeds to cancerous and gangrenous ulcers, and terminates only in death. Death is alſo, almoſt univerſally, the conſequence of hectic fever from tubercles of the lungs, which have in general at leaſt been conſidered as glandular bodies in a ſcirrhous ſtate.

Cure. It is not to be expected that the ſame remedies will in every caſe be adapted to a fever which, ariſing from very different cauſes, is attended with ſuch a variety of ſymptoms. A mixture of aſafetida and opium has in ſome perſons ſeemed ſingularly ſerviceable in this fever, when brought on by a ſmall wound; but in moſt other caſes the principal if not the ſole attention of the phyſician muſt be employed in relieving the ſymptoms, by tempering the heat, by preventing both coſtiveneſs and purging, by procuring ſleep, and by checking the ſweats. If, at the ſame time, continues Dr Heberden, he put the body into as good general health as may be, by air, exerciſe, and a proper courſe of mild diet, he can perhaps do nothing better than to leave all the reſt to nature. In ſome few fortunate patients, nature appears to have ſuch reſources, as may afford reaſon for entertaining hopes of cure, even in very bad caſes. For ſome have recovered from this fever attended with every ſymptom of an abdominal viſcus incurably diſeaſed, after all probable methods of relief from art had been tried in vain, and after the fleſh and ſtrength were ſo exhauſted as to leave ſcarce any hopes from nature. In thoſe deplorable circumſtances, there has ariſen a ſwelling not far from the probable ſeat of the diſorder, and yet without any diſcoverable communication with it. This ſwelling has come to an abceſs; in conſequence of which the pulſe has ſoon returned to its natural ſtate, as have alſo the appetite, fleſh and ſtrength. What nature has performed in thoſe rare caſes, Dr Heberden acquaints us, he has often endeavoured to imitate, by making iſſues or applying bliſters near the ſeat of the diſeaſe; but he cannot ſay with the ſame ſucceſs.

It ſeems at preſent, Dr Heberden obſerves, the opinion of many practitioners, that the gangrenes will be ſtopped, and ſuppuration become more kindly, by the uſe of Peruvian bark; and therefore this remedy is always either adviſed or permitted in the irregular fever joined with ſuppurations and gangrenes. But he affirms he does not remember ever to have ſeen any good effect from the bark in this fever unattended with an apparent ulcer; and even in gangrenes it ſo often fails, that in ſucceſsful caſes, where it has been adminiſtered, there muſt be room for ſuſpicion that that the ſucceſs was owing to another cauſe. Dr Heberden acknowledges at the ſame time, that he never ſaw any harm from the bark, in theſe, or indeed in any other caſes, except a ſlight temporary purging or ſickneſs, where it has happened to diſagree with the ſtomach, or where the latter has been loaded by taking the medicine too faſt, eſpecially in dry boluſes wrapped in wafer-paper.

In hectic illneſſes, where all other means have proved ineffectual, a journey to bath is uſually propoſed by the friends, and wiſhed for by the ſick; but Dr Heberden juſtly obſerves, that, beſides the fatigue and many inconveniences of a journey to a dying perſon, the Bath waters are peculiarly hurtful in this fever, which they never fail to increaſe, and thereby aggravate the ſufferings and haſten the death of the patient.

ORDER II. PHLEGMASIÆ. 171

Phlegmaſiæ membranoſæ et parenchymatoſæ, *Sauv.* Claſs III. Ord. I. II. *Sag.* 605.
Morbi febriles phlogiſtici, *Lin.* Claſs III.
Febres continuæ compoſitæ inflammatoriæ, V.
Morbi acuti febriles, *Boerh.* 770.
Febres inflammatoriæ, *Hoffm.* II. 105. *Junck.* 61.

The phlegmaſiæ, or topical inflammations, are a very numerous aſſemblage of diſeaſes. Their great char-

Phlegmaſiæ.

characteriſtics are, the general ſymptoms of fever, and a topical inflammation, attended with the leſion of ſome important function. And in moſt inſtances, when blood is drawn, it is found upon coagulation to be covered with a buffy coat. Under this order, many important genera are comprehended, each requiring a ſeparate conſideration.

172 Genus VII. PHLOGOSIS.

173 Sp. I. Phlogosis phlegmome.

Phlegmone auctorum, *Sauv.* gen. 15. *Lin.* 39. *Vog.* 351.
Inflammatio, *Lin.* 231. *Boerh.* 370. *Junck.* 20.

This diſeaſe is a ſynocha fever, accompanied with an inflammation of ſome particular part either external or internal, and conſequently it varies very much in its form and the degree of danger attending it, according to the ſituation and functions of the part affected with topical inflammation. To this ſpecies, therefore, belong the following diſeaſes.

Furunculus, *Sauv.* gen. 18. *Vog.* 352.
Terminthus, *Vog.* 381.
Pupula, *Lin.* 275. *Sauv.* p. 6.
Varus, *Vog.* 436. *Lin.* 269. *Sauv.* p. 7.
Bacchia, *Lin.* 270.
Gutta Roſea, *Sauv.* gen. 4.
Gutta roſacea, *Vog.* 437.
Hordeolum, *Sauv.* gen, 27. *Lin.* 276. *Vog.* 434
Otalgia, *Sauv.* gen. 197. *Lin.* 44. *Vog.* 148.
Dolor otalgicus, *Hoffm.* II. 336.
Parulis, *Vog.* 362.
Maſtodynia, *Sauv.* gen. 210. *Vog.* 153.
Paronychia, *Sauv.* gen. 21. *Lin.* 258. *Vog.* 345.
Arthrocace, *Sauv.* gen. 78. *Lin.* 256.
Paedarthrocace. *Vog.* 419.
Spina ventoſa, *Boerh.* 526.
Phimoſis, *Sauv.* gen. 22. *Lin.* 297, *Vog.* 348.
paraphimoſis, *Vog.* 349.

For the cure of inflammations, Dr Cullen lays down the following indications. 1. To remove the remote cauſes when they are evident and continue to operate. 2. To take off the phlogiſtic diatheſis affecting the whole ſyſtem, or the particular part. 3. To take off the ſpaſm of the particular part by remedies applied to the whole ſyſtem or to the part itſelf.

The means of removing the remote cauſes will readily occur, from conſidering the particular nature and circumſtances of the different kinds. Acrid matters muſt be removed, or their action muſt be prevented, by the application of demulcents, Compreſſing and overſtretching powers muſt be taken away; and from their ſeveral circumſtances, the means of doing ſo will be obvious.

The means of taking off the phlogiſtic diatheſis of the ſyſtem are the ſame with thoſe already mentioned under the cure for ſynocha. The means of taking off the ſpaſm alſo from the particular part, are much the ſame with thoſe already mentioned. Only it is to be remembered, that topical bleedings, ſuch as cupping with ſcarifications, applying leeches, &c. are in this caſe much more indicated; and that ſome of the other remedies are to be directed more particularly to the part affected, as ſhall be more fully conſidered when we treat of thoſe diſeaſes attended with particular inflammations.

Phlogoſis.

When a tendency to ſuppuration is perceived, the proper indication is to promote the production of perfect pus as much as poſſible. For this purpoſe various remedies, ſuppoſed to poſſeſs a ſpecific power, have been propoſed: but it does not appear that any of them are poſſeſſed of a virtue of this kind; and, in Dr Cullen's opinion, all that can be done is to favour the ſuppuration by ſuch applications as may ſupport a moderate heat in the part, by ſome tenacity confine the perſpiration, and by an emollient quality may weaken the coheſion of the teguments, and favour their eroſion As all abſceſſes are occaſioned by the effuſion of fluids and as in the caſe of certain effuſions a ſuppuration becomes not only unavoidable but deſirable, it may be ſuppoſed that moſt of the means of procuring a reſolution by diminiſhing the force of circulation, &c. ought to be avoided, but as we obſerve on the one hand, that a certain degree of increaſed impetus, or of the original ſymptoms of inflammation, is neceſſary to produce a proper ſuppuration; ſo it is then eſpecially neceſſary to avoid thoſe means of reſolution which may diminiſh too much the force of circulation. And on the other hand, as the impetus of the blood, when violent, is found to prevent the proper ſuppuration; ſo, in ſuch caſes, though a tendency to ſuppuration may have begun, it may be proper to continue thoſe means of reſolution which moderate the force of the circulation, With reſpect to the opening of abſceſſes when completely formed, ſee the article Surgery.

When an inflammation has taken a tendency to gangrene, that event is to be prevented by every poſſible means; and theſe muſt be different according to the nature of the ſeveral cauſes: but after a gangrene has in ſome degree taken place, it can be cured only by the ſeparation of the dead from the living parts. This in certain circumſtances can be performed, and moſt properly, by the knife. In other caſes it can be done by exciting a ſuppuratory inflammation on the verge of the living part, whereby its coheſion with the dead part may be every where broken off, ſo that the latter may fall off by itſelf. While this is doing, it is proper to prevent the further putrefaction of the part, and its ſpreading wider. For this purpoſe various antiſeptic applications have been propoſed: but Dr Cullen is of opinion, that while the teguments are entire, theſe applications can hardly have any effect; and therefore, that the fundamental procedure muſt be to ſcarify the part ſo as to reach the living ſubſtance, and, by the wounds made there, to excite the ſuppuration required. By the ſame inciſions alſo we give acceſs to antiſeptics, which may both prevent the progreſs of the putrefaction in the dead, and excite the inflammation neceſſary on the verge of the living parts.

When the gangrene proceeds from the loſs of tone, and when this communicated to the neighbouring parts prevents that inflammation which, as we have ſaid, is requiſite to the ſeparation of the dead parts from the living, it will be neceſſary to obviate this loſs of tone by tonic medicines given internally; and for this purpoſe the Peruvian bark has been found to be moſt effectual. But when the gangrene ariſes from the violence of inflammation, the bark may not only fail of proving a remedy, but may do harm: for its power as a tonic is eſpecially ſuited to thoſe caſes of gangrene which proceed from an original loſs of tone, as in the caſe of palſy and œdema; or in thoſe caſes where a loſs of tone takes place while the original inflammatory ſymptoms are removed.

On the other hand, Mr Bell is of opinion, that inciſions made with a view to admit the operation of antiſeptic remedies in gangrenes, as well as the remedies themſelves, muſt be pernicious from the irritation they occaſion, and from the danger of wounding blood-veſſels, nerves, or tendons, and alſo by allowing a free paſſage for the putreſcent fluids into the parts not yet affected. And unleſs they be carried ſo deep as to reach the ſound parts, applications of the antiſeptic kind can never have any effect in anſwering the purpoſe for which they were intended. The ſame author alſo remarks, that all the advantages commonly obſerved from the great number of applications recommended for gangrene, are obtained with more eaſe, and generally too with more certainty, from the uſe of ſome gentle ſtimulating embrocation; which, by exciting a ſlight irritation upon the ſurface, eſpecially when aſſiſted by a free uſe of the Peruvian bark, produces for the moſt part ſuch a degree of inflammation as is wiſhed for. With this view he has frequently known a weak ſolution of ſal ammoniac, a drachm of the ſalt to two ounces of vinegar and ſix of water, form a mixture of very proper ſtrength for every purpoſe of this kind. But the degree of ſtimulus can either be eaſily increaſed or diminiſhed according to circumſtances, by uſing a larger or ſmaller proportion of the ſalt.

Whenever, either by the means recommended, or by a natural exertion of the ſyſtem, a ſlight inflammation appears between the diſeaſed and ſound parts, we may in general, with tolerable certainty, expect, that in due time the parts will be ſeparated; and when a full ſuppuration is once fairly eſtabliſhed, there can be little doubt that the mortified parts will be ſoon and eaſily removed.

A complete ſeparation being effected, the remaining ſore is to be treated in the manner deſcribed under the article Surgery; with a proper attention, at the ſame time, to the ſupport of the general ſyſtem by the continuance of a nouriſhing diet, and the bark with ſuch quantities of wine as may ſeem neceſſary.

With regard to the bark, however, it is proper to take notice of another caſe of mortification in which it is likewiſe unſucceſsful, as well as in that attended with an high degree of inflammation; and that is, in thoſe mortifications of the toes and feet, common in old people, or which ariſe from any cauſe increaſing the rigidity of the veſſels to ſuch a degree as to prevent the motion of the fluids through them. In this caſe Mr Pott has diſcovered, that all kinds of warm applications are very unſucceſsful; but that by the free uſe of opium, together with ſedatives and relaxants externally applied, he has frequently ſeen the tumefaction of the feet and ancles ſubſide, the ſkin recover its natural colour, and all the mortified parts ſeparate in a very ſhort time, leaving a clean ſore. But as to ſcarifications, or any other attempt to ſeparate artificially the mortified from the ſound part, he thinks them very prejudicial, by giving pain; which is generally of itſelf violent in this diſeaſe, and which ſeems to have a great ſhare in producing the other evils.

The other terminations of inflammation either do not admit of any treatment except that of preventing them by reſolution, or properly belong to the article Surgery.

Sp. II. Phlogosis erythema.

Erythema, *Sauv.* gen. 11.
  Eryſipelas auctorum, *Vog.* 343.
  Hieropyr. *Vog.* 344.
Anthrax, *Sauv.* gen. 19. *Lin.* 272. *Vog.* 353.
  Carbo et carbunculus auctorum.
  Erythema gangrænoſum, *Sauv.* ſp. 7.
Erythema a frigore.
  Erythema pernio, *Sauv.* ſp. 4
  Pernio, *Lin.* 259. *Vog.* 350.
Erythema ambuſtio, *Sauv.* ſp. 2.
  Eryſipelas ambuſtio, *Sauv.* ſp. 4.
  Combuſtura, *Lin* 245.
  Combuſtio, *Boerh.* 476.
Encauſis, *Vog.* 347.
Erythema ab acri alieno applicato.
  Eryſipelas Chinenſe, *Sauv.* ſp. 7.
Erythema ab acri inquilino.
  Erythema intertrigo, *Sauv.* ſp. 5.
  Intertrigo, *Lin.* 247. *Vog.* 502.
Erythema a compreſſione.
  Erythema paratrima, *Sauv.* ſp. 6.
Erythema a punctura, *Sauv.* ſp. 9.
  Eryſipelas a veſpis, *Sauv.* ſp. 19.
  Pſydracia a veſpis, *Sauv.* ſp. 2.
Erythema cum phlegmone.
  Eryſipelas phlegmonodes auctorum.
Erythema cum œdemate.
  Eryſipelas ſymptomaticum, *Sauv.* ſp. 6

The word *erythema* doth not apply to any primary diſeaſe, but to a great number of thoſe cutaneous inflammations denominated by another general term, *viz.* the *eryſipelas*, or "St Anthony's fire;" and which being commonly ſymptomatic, of ſome other inflammation or diſorder, are to be removed only by removing the primary diſeaſe: the erythema is found ſcarcely to bear any kind of warm application to itſelf; and is very apt, if treated as a primary diſeaſe, to terminate in a gangrene of the part affected, or ſome other diſorder ſtill more dangerous. The difference between the *phlegmon* or preceding ſpecies, and *erythema*, according to Dr Cullen, is, that, in the former, the inflammation ſeems particularly to affect the veſſels on the internal ſurface of the ſkin, communicating with the lax adjacent cellular texture; whence a more copious effuſion, and that too of ſerum convertible into pus, takes place. In the erythema the affection is of the veſſels on the external ſurface of the ſkin communicating with the *rete mucoſum*, which does not admit of any effuſion but what ſeparates the cuticle and gives occaſion to the formation of a bliſter, while the ſmaller ſize of the veſſels admits only of the effuſion of a thin fluid very ſeldom convertible into pus. For the cure of the fever attended with erythema or *eryſipelas*, ſee below; and for the external treatment of erythema, ſee the article Surgery.

Genus VIII. OPHTHALMIA. 175

Inflammation of the Eyes.

Ophthalmia, *Sauv.* gen. 196. *Lin.* 43. *Vog.* 341.
  Sag. 231. *Junck.* 24.
Chemoſis, *Vog.* 46.

Ophthalmites, *Vog.* 47.
Inflammatio oculorum, *Hoffm.* II. 165.
Ophthalmia taraxis, *Sauv.* ſp. 1.
Ophthalmia humida, *Sauv.* ſp. 8.
Ophthalmia chemoſis, *Sauv.* ſp. 12.
Ophthalmia eryſipelatoſa, *Sauv.* ſp. 7.
Ophthalmia puſtuloſa, *Sauv.* ſp. 6.
Ophthalmia phlyctænodes, *Sauv.* ſp. 21.
Ophthalmia choroeidea, *Sauv.* ſp. 13.
Ophthalmia tenebricoſa, *Sauv.* ſp. 10.
Ophthalmia trachoma, *Sauv.* ſp. 4.
Ophthalmia ſicca, *Sauv.* ſp. 5.
Ophthalmia angularis, *Sauv.* ſp. 14.
Ophthalmia tuberculoſa, *Sauv.* ſp. 3.
Ophthalmia trichiaſis, *Sauv.* ſp. 2.
Ophthalmia cancroſa, *Sauv.* ſp. 15.
Ophthalmia a ſynechia, *Sauv.* ſp. 16.
Ophthalmia a lagophthalmo, *Sauv.* ſp. 17.
Ophthalmia ab elcomate, *Sauv.* ſp. 18.
Ophthalmia ab ungue, *Sauv.* ſp. 19.
Ophthalmia a corneæ fiſtula, *Sauv.* ſp. 20.
Ophthalmia uveæ, *Sauv.* ſp. 22.
Ophthalmia metaſtatica, *Sauv.* ſp. 24.
Ophthalmia ſcrophuloſa, *Sauv.* ſp. 9.
Ophthalmia ſyphilitica, *Sauv.* ſp. 11.
Ophthalmia febricoſa, *Sauv.* ſp. 23.

From reading this long liſt of diſtinctions which authors have invented in the ophthalmia, it is evident, that by far the greateſt part of them are ſymptomatic, or merely the conſequences of other diſorders preſent in the habit; and therefore the remedies muſt be directed towards the removal of theſe primary diſorders; and when they are gone the ophthalmia will be removed of courſe. Dr Cullen obſerves, that the inflammation of the eye may be conſidered as of two kinds; according as it is ſeated in the membranes of the ball of the eye, when it is named *ophthalmia membranarum*; or as it is ſeated in the ſebaceous glands placed in the tarſus, or edges of the eye lids, in which caſe it may be termed *ophthalmia tarſi*. Theſe two kinds are very frequently connected together, as the one may excite the other; but they are ſtill to be diſtinguiſhed according as the one or the other may happen to be the primary affection.

1. The inflammation of the *membranes* of the eye affects eſpecially, and moſt frequently, the adnata, and appears in a turgeſcence of its veſſels; ſo that the red veſſels which are naturally there, become not only increaſed in ſize, but many more appear than in a natural ſtate. This turgeſcence of the veſſels is attended with pain, eſpecially from the motion of the ball of the eye; and this irritation, like every other, applied to the ſurface of the eye, produces an effuſion of tears from the lacrymal gland.

The inflammation commonly, and chiefly, affects the adnata ſpread on the anterior part of the bulb of the eye; but uſually ſpreads alſo along the continuation of the adnata on the inſide of the palpebræ; and as that is extended on the tarſus palpebrarum, the excretories of the ſebaceous glands opening there are alſo frequently affected. When the affection of the adnata is conſiderable, it may be communicated to the ſubjacent membranes of the eye, and even to the retina itſelf; which thereby acquires ſo great ſenſibility, that every impreſſion of light becomes painful. The inflammation of the membranes of the eye is in different degrees, according as the adnata is more or leſs affected, or according as the inflammation is either of the adnata alone, or of the ſubjacent membranes alſo; and upon theſe differences, different ſpecies have been eſtabliſhed; but they ſeem all to differ only in degree, and are to be cured by the ſame remedies more or leſs employed.

The proximate cauſe of ophthalmia is not different from that of inflammation in general; and the different circumſtances of ophthalmia may be explained by the difference of its remote cauſes, and by the different parts of the eye which it happens to affect; as may be underſtood by what has been already ſaid. We ſhall therefore proceed to give an account of the method of cure.

The great objects to be aimed at in the treatment of ophthalmia, are, in the firſt place, the reſolution of the inflammation which has already taken place; and, ſecondly, the removal of thoſe conſequences which frequently ariſe from the inflammation, eſpecially if it have been of long ſtanding. But beſides theſe, while it has appeared from former obſervation, that there is a peculiar diſpoſition to the diſeaſe, practices may often be ſucceſsfully employed to combat this diſpoſition, and thus prevent the return of the affection.

The ophthalmia membranarum requires the remedies proper for inflammation in general; and when the deeper-ſeated membranes are affected, and eſpecially when a pyrexia is preſent, large general bleedings may be neceſſary. But this laſt is ſeldom the caſe; and, for the moſt part, the ophthalmia is an affection merely local, accompanied with little or no pyrexia. General bleedings therefore have little effect upon it, and the cure is chiefly to be obtained by topical bleedings, that is, blood drawn from the veſſels near the inflamed part; and opening the jugular vein, or the temporal artery, may be conſidered as in ſome meaſure of this kind. It is commonly ſufficient to apply a number of leeches round the eye; but it is perhaps ſtill better to draw blood by cupping and ſcarifying upon the temples. In many caſes, the moſt effectual remedy is to ſcarify the internal ſurface of the inferior eye-lid, and to cut the turgid veſſels upon the adnata itſelf.

Beſides the blood-letting, purging, as a remedy ſuited to inflammation in general, has been conſidered as peculiarly adapted to inflammation in any part of the head, and therefore to ophthalmia; and it is ſometimes uſeful: but, for the reaſons given before with reſpect to general bleeding, purging in the caſe of ophthalmia does not prove uſeful in any proportion to the evacuation excited. For relaxing the ſpaſm in the part, and taking off the determination of the fluids to it, bliſtering near the part has commonly been found uſeful. When the inflammation does not yield to the application of bliſters after topical bleeding, great benefit is often obtained by ſupporting a diſcharge from the bliſtered part, under the form of an iſſue, by which means a more permanent determination of blood from the part is obtained.

It is probably alſo on the ſame principle that the good effects obtained from the uſe of errhine medicines in obſtinate caſes of ophthalmia are to be accounted for. By theſe errhines, in particular, which occaſion and ſupport for ſome time a great diſcharge from the noſe, great benefit has often been obtained. The powder of aſarabacca, or the infuſion of hippocaſtanum, ſnuffed up the noſe at bed-time in proper doſes, are often productive of the beſt effects, when many other remedies have been tried in vain.

Ophthalmia, as an external inflammation, admits of topical applications. All thoſe, however, which increaſe the heat and relax the veſſels of the part, prove hurtful; and the admiſſion of cool air to the eye, and the application of cooling and aſtringent medicines which at the ſame time do not produce irritation, prove uſeful. Of all theſe the ſolution of acetated lead, aſſiduouſly applied, is perhaps the beſt. In the cure of this diſtemper, indeed, all irritation muſt carefully be avoided, particularly that of light; and the only certain means of doing this is by keeping the patient in a very dark chamber.

2. In the *ophthalmia tarſi*, the ſame medicines may be neceſſary, as have been already recommended, for the ophthalmia membranarum. However, as the ophthalmia tarſi may often depend upon an acrimony depoſited in the ſebaceous glands of the part, ſo it may require various internal remedies according to the variety of the acrimony in fault; for which we muſt refer to the conſideration of ſcrophula, ſyphilis, or other diſeaſes with which this ophthalmia may be connected; and where theſe ſhall not be evident, certain remedies more generally adapted to the evacuation of acrimony, ſuch as mercury, may be employed. In the ophthalmia tarſi, it almoſt conſtantly happens that ſome ulcerations are formed on the tarſus. Theſe require the application of mercury and copper, which alone may ſometimes cure the whole affection; and they may be uſeful even when the diſeaſe depends upon a fault of the whole ſyſtem.

Both in the ophthalmia membranarum, and in the ophthalmia tarſi, it is neceſſary to obviate that glueing together of the eye-lids which commonly happens in ſleep; and which may be done by inſinuating a little of any mild unctuous medicine between the eye-lids before the patient ſhall go to ſleep,

The ſlighter kinds of inflammations from the duſt or the ſun, may be removed by fomenting with warm milk and water, adding a ſmall portion of brandy; and by anointing the borders of the eye-lids with *unguentum tutiæ*, or the like, at night, eſpecially when thoſe parts are excoriated and ſore. But in bad caſes after the inflammation has yielded a little to evacuations, the *cataplaſma aluminis* of the London pharmacopœia ſpread on lint, and applied at bed-time, has been found the beſt external remedy. Before the uſe of the latter, the ſolution of white vitriol is preſcribed with advantage; and in violent pains it is of ſervice to foment frequently with a decoction of white poppy heads. One of the moſt common and moſt diſagreeable conſequences of ophthalmia, is an offuſcation of the cornea, ſo far obſtructing the paſſage of light as to diminiſh or prevent viſion. This is ſometimes ſo conſiderable as to admit of removal by operation: but in ſlighter caſes it may often be removed by the application of different gentle eſcharotics; and in this way, without the leaſt danger of any inconvenience, good effects are often obtained, from gently introducing into the eye at bed-time a powder conſiſting of equal parts of cryſtals of tartar and ſugar.

Where there is a diſpoſition to frequent returns of this affection, the Peruvian bark is often employed with ſucceſs in combating it: But nothing in general anſwers better than frequent and regular cold bathing of the eyes.

GENUS IX. PHRENITIS. 176

PHRENZI, or *Inflammation of the Brain.*

Phrenitis, *Sauv.* gen. 101. *Lin.* 25. *Sag.* gen. 301
Boerh. 771. *Hoffm.*II. 131. *Junck.* 63.
Phreniſmus, *Vog.* 45.
Cephalitis, *Sauv.* gen. 109. *Sag.* gen. 310.
Sphaceliſmus,, *Lin.* 32
Phrenitis vera, *Sauv.* ſp 1. *Boerh.* 771.
Phrenitis idiopathica, *Junck.* 63.
Cephalalgia inflammatoria, *Sauv.* Sp. 9.
Cephalitis ſpontanea, *Sauv.* ſp. 3.
Cephalitis ſiriaſis, *Sauv.* ſp. 4.
Siriaſis, *Vog.* 34.
Cephalitis Littriana, *Sauv.* ſp. 5.

Dr Cullen obſerves, that the true phrenitis, or inflammation of the membranes or ſubſtance of the brain, is very rare as an original diſeaſe: but, as a ſymptom of others, much more frequent; of which the following kinds are enumerated by different authors.

Phrenitis ſynochi pleuriticæ, *Sauv.* ſp. 2.
Phrenitis ſynochi ſanguineæ, *Sauv.* ſp. 4.
Phrenitis calentura, *Sauv.* ſp. 11.
Phrenitis Indica, *Sauv.* ſp. 12.
Cephalitis Ægyptiaca, *Sauv.* ſp. 1.
Cephalitis epidemica anno 1510, *Sauv.* ſp. 6.
Cephalitis verminoſa, *Sauv.* ſp. 7.
Cephalitis cerebelli, *Sauv.* ſp. 8.
Phrenitis miliaris, *Sauv.* ſp. 3.
Phrenitis varioloſa, *Sauv.* ſp. 5.
Phrenitis morbilloſa, *Sauv.* ſp. 6.
Phrenitis a plica, *Sauv.* ſp. 8.
Phrenitis aphrodiſiaca, *Sauv.* ſp. 9.
Phrenitis a tarantiſmo, *Sauv.* ſp. 14.
Phrenitis hydrophobica, *Sauv.* ſp. 15.
Phrenitis a dolore, *Sauv.* ſp. 13.
Cephalitis traumatica, *Sauv.* ſp. 2.

Deſcription. The ſigns of an impending phrenitis are, immoderate and continual watchings; or if any ſleep be obtained, it is diſturbed with dreams and gives no refreſhment; acute and laſting pains, eſpecially in the hind part of the head and neck; little thirſt; a great and ſlow reſpiration, as if proceeding from the bottom of the breaſt, the pulſe ſometimes ſmall and ſlow, ſometimes quick and frequent; a ſuppreſſion of urine; and forgetfulneſs. The diſtemper when preſent may be known by the following ſigns: The veins of the head ſwell, and the temporal arteries throb much; the eyes are fixed, ſparkle, and have a fierce aſpect; the ſpeech is incoherent, and the patient behaves very roughly to the by-ſtanders, with furious attempts to get out of bed, not indeed connually, but returning as it were by paroxyſms; the tongue is dry, rough, yellow, or black; there is a coldneſs of the external parts; a proneneſs to anger; chattering of the teeth;, a trembling of the hands, with which the ſick ſeem to be gathering ſomething and actually do gather the naps off the bed clothes.

Cauſes of, and perſons ſubject to, this diſorder. People of a hot and bilious habit of body, and ſuch as are of a paſſionate diſpoſition, are apt to be affected with phrenitis. In the ſame danger are thoſe who uſe much ſpices, or are given to hot and ſpirituous liquors; who have been expoſed more than uſual to the ſun, or obliged to undergo immoderate ſtudies or watchings; who are ſubject to head-achs, or in whom ſome cuſtomary hemorrhages have been ſtopped; or the diſeaſe may ariſe from ſome injury offered to the head externally. Dr Pringle obſerves, that the phrenitis, when conſidered as an original diſeaſe, is apt to attack ſoldiers in the ſummer-ſeaſon when they are expoſed to the heat of the ſun, and eſpecially when aſleep and in liquor. A ſymptomatic phrenitis is alſo more frequent in the army than elſewhere, on account of the violence done to all fevers when the ſick are carried in waggons from the camp to an hoſpital, where the very noiſe or light alone would be ſufficient, with more delicate natures, to raiſe a phrenzy. From theſe and ſimilar cauſes, a ſtate of active inflammation, affecting ſome parts within the cranium, is produced: and there can be no doubt, that from this all the ſymptoms of the diſeaſe ariſe, and particularly that peculiar delirium which characteriſes it. But in what manner local diſeaſes, even of the brain itſelf, produce affections of the mind, we are ſtill totally in the dark.

Prognoſis. Every kind of phrenitis, whether idiopathic or ſymptomatic, is attended with a high degree of danger; and, unleſs removed before the fourth day, a gangrene or ſphacelus of the meninges readily takes place, and the patient dies delirious. The following are the moſt fatal ſymptoms: A continual and furious delirium, with watching; thin watery urine, white fæces, the urine and ſtools running off involuntarily or a total ſuppreſſion of theſe excretions; a ready diſpoſition to become ſtupid, or to faint; trembling, rigor, chattering of the teeth, convulſions, hiccough, coldneſs of the extremities, trembling of the tongue, ſhrill voice, a ſudden ceſſation of pain, with apparent tranquillity. The following are favourable: Sweats, apparently critical, breaking out; a ſeeming effort of nature to terminate the diſeaſe by a diarrhœa; a large hemorrhagy from the noſe; ſwellings of the glands behind the ears; hæmorrhoids.

Cure. From what has been ſaid of the theory of this diſeaſe, the cure muſt entirely depend on obtaining a reſolution of the inflammation. The objects chiefly to be aimed at with this view are, 1. The removal of ſuch exciting cauſes as continue to operate. 2. The diminution of the momentum of the blood in the circulating ſyſtem in general. 3. The diminution of impetus at the brain in particular: and, 4. The avoiding circumſtances which tend either to accelerate the motion of the blood or to give determination to the head.

Different practices may be uſed with theſe intentions; but here the moſt powerful remedies are to be immediately employed. Large and repeated bleedings are eſpecially neceſſary; and theſe too taken from veſſels as near as poſſible to the part affected. The opening the temporal artery has been recommended and with ſome reaſon: but as the practice is attended with ſome inconveniences, perhaps the opening of the jugular veins may prove more effectual; with which, however, may be joined the drawing of blood from the temples by cupping and ſcarifying. It is alſo probable, that purging may be of more uſe in this than in ſome other inflammatory affections, as it may operate by revulſion. For the ſame purpoſe of revulſion, warm pediluvia are a remedy, but rather ambiguous. The taking off the force of the blood in the veſſels of the head by an erect poſture is generally uſeful. Bliſtering is alſo uſeful, but chiefly when applied near to the part affected. In ſhort, every part of the antiphlogiſtic regimen is here neceſſary, and particularly the admiſſion of cold air. Even cold ſubſtances applied to the head have been found uſeful; and the application of ſuch refrigerants as vinegar is certainly proper. Opiates are thought to be hurtful in every inflammatory ſtate of the brain. On the whole, however, it muſt be remarked, that practitioners are very uncertain with regard to the means proper to be uſed in this diſeaſe; and the more ſo, that the ſymptoms by which the diſeaſe is commonly judged to be preſent, appear ſometimes without any internal inflammation; and on the other hand, diſſections have ſhown that the brain has been inflamed, where few of the peculiar ſymptoms of inflammation had appeared before.

GENUS X. CYNANCHE. 177

Cynanche, *Sauv.* gen. 110. *Lin.* 33. *Sag.* gen. 300.
Angina, *Vog.* 49. *Hoffm.* II 125. *Junck.* 30.
Angina inflammatoria, *Boerh.* 798.

Sp. I. CYNANCHE TONSILLARIS. 178
The *Inflammatory Quinsy*.

Cynanche tonſillaris, *Sauv.* ſp. 1.
Anginæ inflammatoria, ſp. 5. *Boerh.* 805.

Deſcription. This is an inflammation of the mucous membrane of the fauces, affecting principally that congeries of mucous follicles which forms the tonſils; and from thence ſpreading along the velum and uvula, ſo as frequently to affect every part of the mucous membrane. The diſeaſe appears by ſome tumour and redneſs of the parts; is attended with a painful and difficult deglutition; a troubleſome clammineſs of the mouth and throat; a frequent but difficult excretion of mucus; and the whole is accompanied with pyrexia. The inflammation and tumor are commonly at firſt moſt conſiderable in one tonſil; and afterwards, abating in that, increaſe in the other. This diſeaſe is not contagious.

Cauſes of and perſons ſubject to, this diſorder. This diſeaſe is commonly occaſioned by cold externally applied, particularly about the neck. It affects eſpecially the young and ſanguine; and a diſpoſition to it is often acquired by habit. It occurs eſpecially in the ſpring and autumn, when viciſſitudes of heat and cold frequently take place.

Prognoſis. This ſpecies of quinſy terminates frequently by reſolution, ſometimes by ſuppuration, but hardly ever by gangrene; though in ſome caſes ſloughy ſpots appear on the fauces: the prognoſis therefore is generally favourable.

Cure. As the principal morbid affection in this diſeaſe, on which all its characteriſing ſymptoms im-

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mediately depend, is the active inflammation in the tonſils and neighbouring parts, the object firſt and principally to be aimed at in the cure is to obtain a reſolution of this inflammation. Sometimes, however, it is neceſſary to have recourſe to practices, with the view of obviating urgent ſymptoms before a reſolution can be effected: and in other caſes, where a reſolution cannot be obtained, it muſt be the aim of the practitioner to promote a ſpeedy and favourable ſuppuration. After ſuppuration has taken place, the proper means of promoting a diſcharge of the purulent matter will conclude the cure. Here ſome bleeding may be neceſſary; but large and general evacuations are ſeldom beneficial. The opening of the ranular veins ſeems to be an inſignificant remedy, according to Dr Cullen but is recommended as efficacious by Sir John Pringle: more benefit, however, may in general be derived from leeches to the external fauces. The inflammation may be often relieved by moderate aſtringents, and particularly by acids applied to the parts affected. In many caſes, nothing has been found to give more relief than the vapour of warm water received into the fauces.

Beſides theſe, bliſtering, and ſtill more frequently rubefacient medicines, are applied with ſucceſs, as well antiphlogiſtic purgatives; and every part of the antiphlogiſtic regimen is to be obſerved, except the application of cold. Sir John Pringle recommends a thick piece of flannel moiſtened with two parts of common ſweet oil, and one of ſpirit of hartſhorn (or in a larger proportion, if the ſkin will bear it), to be applied to the throat, and renewed once every four or five hours. By this means the neck, and ſometimes the whole body, is put into a ſweat, which after bleeding either carries off or leſſens the inflammation. When the diſeaſe takes a tendency to ſuppuration, nothing will be more uſeful than the taking into the fauces the ſteams of warm water. Benefit is alſo obtained from poultices applied to the external fauces. When the abſceſs is attended with much ſwelling, if it break not ſpontaneouſly, it ought to be opened by a lancet; and this does not require much caution, as even the inflammatory ſtate may be relieved by ſome ſcarification of the tonſils. When this diſeaſe runs very rapidly to ſuch a height as to threaten ſuffocation, it is ſometimes neceſſary to have recourſe to bronchotomy as the only mean of ſaving the life of the patient. But there is reaſon to believe that this operation has ſometimes been employed where it was not neceſſary: and we may ſafely venture to ſay, that it is but ſeldom requiſite; inſomuch that Dr Cullen tells us, that he has never in his practice ſeen any caſe requiring bronchotomy.

Sp. II. CYNANCHE MALIGNA.

The *malignant*, *putrid*, or *ulcerous* SORE THROAT.

Cynanche maligna, *Sauv.* ſp. 3.
Cynanche ulceroſa, *Sauv.* var. a. Journ. de Med. 1758.
Cynanche gangrænoſa, *Sauv.* var. b. Journ. de Med. 1756.
Ulcera faucium et gutturis anginoſa et lethalia. Hiſpanis *Garrotillo*, *Lud. Mercat.* conſult. 24.
Angina ulceroſa, *Fothergill*'s Account of the ulcerous ſore throat, edit. 1751. *Huxham* on the malignant ulcerous ſore throat, from 1751 to 1753.
Febris epidemica cum angina ulcuſculoſa, *Douglas*'s Practical Hiſtory, Bonon 1736.
Angina epidemica, *Ruſſel*, Oecon. Natur. p. 105.
Angina gangrænoſa, *Withering*'s Diſſert. Inaug. Edinb. 1766.
Angina ſuffocativa, *Bard*'s Inquiry, New-York, 1771.
Angina maligna, *Johnſtone* on the malignant Angina, Worceſter, 1779.

Cynanche.

Hiſtory and deſcription. This diſtemper is not particularly deſcribed by the ancient phyſicians; though perhaps the Syrian and Egyptian ulcers mentioned by Aretæus Cappadox, and the peſtilent ulcerated tonſils we read of in Aeticus, Amideus were of this nature. Some of the ſcarlet fevers mentioned by Morton ſeem alſo to have approached near to it. In the beginning of the laſt century, a diſeaſe exactly ſimilar to this is deſcribed by the phyſicians of that time, as raging with great violence and mortality in Spain and ſome parts of Italy; but no account of it was publiſhed in this country till the year 1748, when a very accurate one was drawn up by Dr Fothergill, and in 1752 by Dr Huxham. The latter obſerves, that this diſeaſe was preceded by long, cold, and wet ſeaſons; by which probably the bodies of people were debilitated, and more apt to receive contagion, which poſſibly alſo might be produced by the ſtagnant and putrid waters.

The attack of this diſeaſe was very different in different perſons. Sometimes a rigor, with fulneſs and ſoreneſs of the throat, and painful ſtiffneſs of the neck, were the firſt ſymptoms complained of. Sometimes alternate chills and heats, with ſome degree of giddineſs, drowſineſs, or head-ach, uſhered in the diſtemper. It ſeized others with much more feveriſh ſymptoms; great pain of the head, back, and limbs; a vaſt oppreſſion of the præcordia, and continual ſighing. Some grown perſons went about for ſome days in a drooping ſtate with much uneaſineſs and anxiety, till at laſt they were obliged to take to their beds.—Thus various was the diſeaſe, ſays Dr Huxham, at the onſet. But it commonly began with chills and heats, load and pain of the head, ſoreneſs of throat, and hoarſeneſs; ſome cough, ſickneſs at ſtomach, frequent vomiting and purging, in children eſpecially, which were ſometimes very ſevere; though a contrary ſtate was more common to the adult. There was in all a very great dejection of ſpirits, very ſudden weakneſs, great heavineſs on the breaſt, and faintneſs, from the very beginning. The pulſe in general was quick, ſmall, and fluttering, though ſometimes heavy and undulating. The urine was commonly pale, thin, and crude; however in many grown perſons, it was paſſed in ſmall quantities and high-coloured, or like turbid whey. The eyes, were heavy, reddiſh, and as it were weeping; the countenance very often full, fluſhed, and bloated, though ſometimes pale, and ſunk.

How ſlight ſoever the diſorder might appear in the day time, at night the ſymptoms became greatly aggravated, and the feveriſh habit very much increaſed, nay, ſometimes a delirium occurred on the very firſt night; and this exacerbation conſtantly returned thro' the whole courſe of the diſeaſe. Indeed, when it was conſiderably on the decline, our author ſays he has been often pretty much ſurpriſed to find his patient had paſſed the whole night in a phrenzy, whom he had left tolerably cool and ſedate in the day.

Some few hours after the ſeizure, and ſometimes cotemporary with it, a ſwelling and ſoreneſs of the throat was perceived, and the tonſils became very tumid and inflamed, and many times the parotid and maxillary glands ſwelled very much, and very ſuddenly, even at the very beginning; ſometimes ſo much as even to threaten ſtrangulation. The fauces alſo very ſoon appeared of a high florid red, or rather of a bright crimſon colour, very ſhining and gloſſy; and moſt commonly on the uvula, tonſils, velum palatinum, and back part of the pharynx, ſeveral whitiſh or aſh-coloured ſpots appeared ſcattered up and down, which oftentimes increaſed very faſt, and ſoon covered one or both the tonſils, uvula, &c. thoſe in the event proved ſloughs of ſuperficial ulcers (which ſometimes, however, eat very deep into the parts). The tongue at this time, though only white and moiſt at the top, was very foul at the root, and covered with a thick yellowiſh or brown coat. The breath alſo now began to be very nauſeous; which offenſive ſmell increaſed hourly, and in ſome became at length intolerable, and that too ſometimes even to the patients themſelves.

The ſecond or third day every ſymptom became much more aggravated, and the fever much more conſiderable; and thoſe that had ſtruggled with it tolerably well for 30 or 40 hours, were forced to ſubmit. The reſtleſſneſs and anxiety greatly increaſed, as well as the difficulty in ſwallowing. The head was very giddy, pained, and loaded; there was generally more or leſs of a delirium; ſometimes a pervigilium and perpetual phrenzy, though others lay very ſtupid, but often ſtarting and muttering to themſelves. The ſkin was very hot, dry, and rough; there was very rarely any diſpoſition to ſweat. The urine was pale, thin, crude; often yellowiſh and turbid. Sometimes a vomiting was urgent, and ſometimes a very great looſeneſs, in children particularly. The ſloughs were now much enlarged, and of a darker colour, and the ſurrounding parts tended much more to a livid hue. The breathing became much more difficult; with a kind of a rattling ſtertor, as if the patient was actually ſtrangling, the voice being exceeding hoarſe and hollow, exactly reſembling that from venereal ulcers in the fauces: this noiſe in ſpeaking and breathing was ſo peculiar, that any perſon in the leaſt converſant with the diſeaſe might eaſily know it by this odd noiſe; from whence indeed the Spaniſh phyſicians gave it the name of *garrotillo*, expreſſing the noiſe made by perſons when they are ſtrangled with a rope. Our author never obſerved in one of them the ſhrill barking noiſe that we frequently hear in inflammatory quinſies. The breath of all the diſeaſed was very nauſeous; of ſome inſufferably fetid, eſpecially in the advance of the diſtemper to a criſis; and many about the fourth or fifth day ſpit off a vaſt quantity of ſtinking purulent mucus tinged ſometimes with blood; and ſometimes the matter was quite livid, and of an abominable ſmell. The noſtrils likewiſe in many were greatly inflamed and excoriated, continually dripping down a moſt ſharp ichor or ſanious matter, ſo exceſſively acrid, that it not only corroded the lips, cheeks, and hands of the children that laboured under the diſeaſe, but even the fingers and arms of the very nurſes that attended them: as this ulceration of the noſtrils came on, it commonly cauſed an almoſt inceſſant ſneezing in the children; but few adults were affected with it, at leaſt to any conſiderable degree. It was ſurpriſing what quantities of matter ſome children diſcharged this way, which they would often rub on their face, hands, and arms, and bliſter them all over. A ſudden ſtoppage of this rheum from the mouth and noſtrils actually choaked ſeveral cildren; and ſome ſwallowed ſuch quantities of it, as occaſioned excoriations of the inteſtines, violent gripings, dyſentery, &c. nay, even excoriations of the anus and buttocks. Not only the noſtrils, fauces, &c. were greatly affected by this extremely ſharp matter, but the wind-pipe itſelf was ſometimes much corroded by it, and pieces of its internal membrane were ſpit up, with much blood and corruption; and the patients lingered on for a conſiderable time, and at length died tabid; though there were more frequent inſtances of its falling ſuddenly and violently on the lungs, and killing in a peripneumonic manner.

Dr Huxham was aſtoniſhed ſometimes to ſee ſeveral ſwallow with tolerable eaſe, though the tumour of the tonſils and throat, the quantity of thick mucus, and the rattling noiſe in breathing, were very terrible; which he thinks pretty clearly ſhows, that this malignant quinſy was more from the acrimony and abundance of the humours than the violence of the inflammation.

Moſt commonly the angina came on before the exanthemata; but many times the cuticular eruption appeared before the ſore-throat, and was ſometimes very conſiderable, though there was little or no pain in the fauces: on the contrary, a very ſevere angina ſeized ſome patients that had no manner of eruption; and yet, even in theſe caſes, a very great itching and deſquamation of the ſkin ſometimes enſued; but this was chiefly in grown perſons, very rarely in children. In general, however, a very conſiderable effloreſcence broke out on the ſurface of the body, particularly in children; and it moſt commonly happened the ſecond, third, or fourth day: ſometimes it was partial, ſometimes it covered almoſt the whole body, though very ſeldom the face: ſometimes it was of an eryſipelatous kind: ſometimes more puſtular: the puſtules frequently eminent, and of a deep fiery red colour, particularly on the breaſt and arms; but oftentimes they were very ſmall, and might be better felt than ſeen, and gave a very odd kind of roughneſs to the ſkin. The colour of the effloreſcence was commonly of a crimſon hue, or as if the ſkin had been ſmeared over with juice of raſberries, and this even to the fingers ends; and the ſkin appeared inflamed and ſwoln, as it were; the arms, hands, and fingers, were often evidently ſo, and very ſtiff, and ſomewhat painful. This crimſon colour of the ſkin ſeemed indeed peculiar to this diſeaſe. Though the eruption ſeldom failed of giving ſome manifeſt relief to the patient, as to anxiety, ſickneſs at ſtomach, vomiting, purging, &c. yet there was obſerved an univerſal fiery eruption on ſome perſons, without the leaſt abatement of the ſymptoms, nay almoſt every ſymptom ſeemed more aggravated, particularly the fever, load at breaſt, anxiety, delirium; and our author knew more than one or two patients die in the moſt raging phrenzy, covered with the moſt univerſal fiery raſh he ever ſaw: ſo that, as in

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the highly confluent ſmall pox, it ſeemed only to denote the quantity of the diſeaſe, as he terms it.

He had under his care a young gentleman, about 12 years of age, whoſe tongue, fauces, and tonſils, were as black as ink, and he ſwallowed with extreme difficulty; he continually ſpit off immenſe quantities of a black, ſanious, and very fetid matter, for at leaſt eight or ten days:—about the ſeventh day, his fever being ſomewhat abated, he fell into a bloody dyſentery, though the bloody, ſanious, fetid expectoration ſtill continued, with a moſt violent cough. He at length indeed got over it, to the very great ſurpriſe of every one that ſaw him. Now, in this patient, a ſevere and univerſal raſh broke out upon the ſecond and third day; and the itching of his ſkin was ſo intolerable, that he tore it all over his body in a moſt ſhocking manner: yet this very great and timely eruption very little relieved his fever and phrenzy, or prevented the other dreadful ſymptoms mentioned.

An early and kindly eruption, however, was moſt commonly a very good omen; and, when ſucceeded by a very copious deſquamation of the cuticle, one of the moſt favourable ſymptoms that occurred; but when the eruption turned of a duſky or livid colour, or prematurely or ſuddenly receded, every ſymptom grew worſe, and the utmoſt danger impended, eſpecially if purple or black ſpots appeared up and down, as ſometimes happened; the urine grew limpid, and convulſions came on, or a fatal ſuffocation ſoon cloſed the tragedy.

The diſeaſe was generally at the height about the fifth or ſixth day in young perſons, in the elder not ſo ſoon; and the criſis many times was not till the 11th or 12th, and then very imperfect: ſome adults, however, were carried off in two or three days; the diſtemper either falling on the lungs, and killing in a peripneumonic manner; or on the brain, and the patient either died raving or comatoſe. In ſome, the diſeaſe brought on a very troubleſome cough, purulent expectoration, hæmoptoë, and hectic; in which they lingered on for ſeveral weeks, and then died tabid.

If a gentle eaſy ſweat came on the third or fourth day; if the pulſe became more ſlow, firm, and equal; if the ſloughs of the fauces caſt off in a kindly manner, and appeared at the bottom tolerably clean and florid; if the breathing was more ſoft and free, and ſome degree of vigour and quickneſs returned in the eyes; all was well, and a ſalutary criſis followed ſoon by a continuance of the ſweat, and a turbid, ſubſiding, farinaceous urine, a plentiful expectoration, and a very large deſquamation of the cuticle. But if a rigor came on, and the exanthemata ſuddenly diſappeared or turned livid; if the pulſe grew very ſmall and quick, and the ſkin remained hot and parched as it were, the breathing more difficult, the eyes dead and glaſſy, the urine pale and limpid, a phrenzy or coma ſucceeded, with a coldiſh clammy ſweat on the face or extremities; life was deſpaired of; eſpecially if a ſingultus and choaking or gulping in the throat attended, with ſudden, liquid, involuntary, livid ſtools, intolerably fetid. In ſome few patients Dr Huxham obſerved, ſome time before the fatal period, not only the face bloated, ſallow, ſhining, and greaſy as it were, but the whole neck very much ſwoln, and of a cadaverous look; and even the whole body became in ſome degree œdematous; and the impreſſion of a finger would remain fixed in a part, the ſkin not riſing again as uſual; an indication that the blood ſtagnated in the capillaries, and that the elaſticity of the fibres was quite loſt.

Cynanche.

Medical writers are ſtill much divided in opinion, whether the cynanche maligna is to be conſidered as the ſame diſeaſe with the ſcarlatina anginoſa, afterwards to be treated of, or not. This queſtion will afterwards come to be more fully diſcuſſed. At preſent we may only obſerve, that although ulcerous ſore throats of a malignant nature often appear ſporadically, yet that the diſeaſe above deſcribed appears only as an epidemic, and is always the conſequence of contagion.

Prognoſis. This may be eaſily gathered from the above deſcription. The malignant and putrid tendency of the diſeaſe is evident, and an increaſe of the ſymptoms which ariſe from that putreſcent diſpoſition of the body muſt give an unfavourable prognoſtic; as, on the contrary, a decreaſe of theſe, and an apparent increaſe of the *vis vitæ*, are favourable: in general, what is obſerved to be favourable in the nervous and putrid malignant fevers, is alſo favourable in this and *vice verſa*.

Cauſes. Since the accurate accounts given by Dr Fothergill and Huxham of the epidemics which prevailed about 50 years ago, this diſeaſe has frequently been obſerved at times epidemic in almoſt every different part of Britain. Like ſmall pox, meaſles, and chincough, it ſeems in every caſe to be the effect of a peculiar and ſpecific contagion. It has been obſerved to prevail, equally generally in every ſituation, and at every ſeaſon; and on expoſure to the contagion, no age, ſex, or condition, is exempted from it. But the having once had the diſeaſe, ſeems in this affection to afford the ſame ſecurity againſt future contagion as in the ſmall-pox: at leaſt inſtances, where it can be ſaid that the ſame individual has been twice affected with it, are both very rare and very doubtful, as well as in ſmall-pox.

Cure. Like other febrile contagions, the malignant ulcerous ſore throat is terminated only by a natural courſe; and the chief buſineſs of the practitioner is to combat unfavourable occurrences. In this the ſeptic tendency of the diſeaſe is chiefly to be kept in view. The debility with which it is attended renders all evacuations by bleeding and purging improper, except in a few inſtances where the debility is leſs, and the inflammatory ſymptoms more conſiderable. The fauces are to be preſerved from the effects of the acrid matter poured out upon them, and are therefore to be frequently waſhed out by antiſeptic gargles or injections; and the putreſcent ſtate of the whole ſyſtem ſhould be guarded againſt and corrected by internal antiſeptics, eſpecially by the Peruvian bark given in the beginning and continued through the courſe of the diſeaſe. Great benefit is alſo often derived from the liberal uſe of the mineral acids. Both the vitriolic and muriatic, in a ſtate of proper dilution, have been highly extolled by different medical writers, and are productive of the beſt effects in actual practice, when they can be introduced to a ſufficient extent. Emetics, both by vomiting and nauſeating, prove uſeful. When any conſiderable tumor occurs, bliſters applied exter-

Phlegmaſiæ

externally will be of ſervice, and in any caſe may be proper to moderate the inflammation.

Very lately, the internal uſe of the capſicum annuum, or Cayenne pepper as it is commonly called, has been highly celebrated in this affection; and it is particularly ſaid to have been employed with ſingular ſucceſs in the Weſt Indies.

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Sp. III. CYNANCHE TRACHEALIS.
The CROUP

Cynanche trachealis, *Sauv.* ſp. 5.
Cynanche laryngea auctorum, *Eller* de cogn. et curand. morb. ſect. 7.
Anginæ inflammatoriæ, ſp. 1. *Boerh.* 801.
Angina latens et difficilis, *Dodon.* obſ. 18.
Angina interna, *Tulp.* l. 1. obſ. 51.
Angina pernicioſa, *Greg. Horſt.* Obſ. l. iii. obſ. 1.
Suffocatio ſtridula, *Home* on the Croup.
Aſthma infantum, *Millar* on the Aſthma and Chincough.
Aſthma infantum ſpaſmodicum, *Ruſh*, Diſſertatio, Lond. 1770.
Cynanche ſtridula, *Crawford* Diſſert. Inaug. Edin. 1771.
Angina epidemica anno 1743. *Molloy* apud *Rutty's* Hiſtory of the weather.
Morbus ſtrangulatorius, *Starr*, Phil. Tranſ. nº 495.
Morbus truculentus infantum, *Francof.* ad Viadrum et in vicinia graſſans ann. 1758. C. a Bergen. A nova. N. C. tom. ii. p. 157.
Catarrhus ſuffocativus Barbadenſis ann. 1758. *Hillary's* Diſeaſes of Barbadoes.
Angina inflammatoria infantum, *Ruſſel*, Oecon. nat. p. 70.
Angina polypoſa ſive membranacea *Michealis*. Argentorati 1778, et auctores ab eo allegati.

The beſt deſcription of this diſeaſe we have in Dr Cullen's Practice of Phyſic. He informs us, that it conſiſts in an inflammation of the glottis, larynx, or upper part of the trachea, whether it affect the membranes of theſe parts or the muſcles adjoining. It may ariſe firſt in theſe parts, and continue to ſubſiſt in them alone; or it may come to affect theſe parts from the cynanche tonſillaris, or maligna, ſpreading into them.

In either way it has been a rare occurrence, and few inſtances of it have been marked and recorded by phyſicians. It is to be known by a peculiar croaking ſound of the voice, by difficult reſpiration, with a ſenſe of ſtraitening about the larynx, and by a pyrexia attending it.

From the nature of theſe ſymptoms, and from the diſſection of the bodies of perſons who died of this diſeaſe, there is no doubt of its being of an inflammatory kind. It does not, however, always run the courſe of inflammatory affections; but frequently produces ſuch an obſtruction of the paſſage of the air, as ſuffocates, and thereby proves ſuddenly fatal.

It particularly proves fatal, in conſequence of the trachea being obſtructed by a membranous ſubſtance lining the inſide of it, and very nearly approaching in appearance to the inflammatory exudation often diſcovered on the inteſtinal canal in thoſe dying of enteritis.

Cynanche.

If we judge rightly of the nature of this diſeaſe, it will be obvious, that the cure of it requires the moſt powerful remedies of inflammation to be employed upon the very firſt appearance of the ſymptoms. When a ſuffocation is threatened, whether any remedies can be employed to prevent it, is not yet determined by ſufficient experience: but it is evident, that in certain caſes the life of the patient can be preſerved only by the removal of that matter which obſtructs the paſſage of air through the trachea.

The accounts which books have hitherto given us of inflammations of the larynx, and the parts connected with it, amount to what we have now ſaid; and many inſtances are recorded of the diſeaſe happening in adult perſons: but there is a peculiar affection of this kind happening to infants which has been little taken notice of till lately. Dr Home is the firſt who has given any diſtinct account of this diſeaſe; but ſince he wrote, ſeveral other authors have taken notice of it, and have given different opinions concerning it.

This diſeaſe ſeldom attacks infants till after they have been weaned. After this period, the younger they are, the more they are liable to the diſeaſe. The frequency of it becomes leſs as children become more advanced; and there are few inſtances of children above 12 years of age being affected with it. It attacks children of the midland countries, as well as thoſe who live near the ſea; but it occurs much more frequently at certain places than at others. It does not appear to be contagious; and its attacks are frequently repeated in the ſame child. It is often manifeſtly the effects of cold applied to the body; and therefore appears moſt frequently in the winter and ſpring ſeaſons. It very commonly comes on with the ordinary ſymptoms of a catarrh; but ſometimes the peculiar ſymptoms of the diſeaſe ſhow themſelves at the very firſt.

Theſe peculiar ſymptoms are the following: A hoarſneſs, with ſome ſhrillneſs and ringing ſound, both in ſpeaking and coughing, as if the noiſe came from a brazen tube. At the ſame time, there is a ſenſe of pain about the larynx, ſome difficulty of reſpiration, with a whizzing ſound in inſpiration, as if the paſſage of the air were ſtraitened. The cough which attends it, is commonly dry; and if any thing be ſpit up, it is a matter of a purulent appearance, and ſometimes films reſembling portions of a membrane. With all theſe ſymptoms, there is a frequency of pulſe, a reſtleſſneſs, and an uneaſy ſenſe of heat. When the internal fauces are viewed, they are ſometimes without any appearance of inflammation; but frequently a redneſs, and even ſwelling, appears; and ſometimes there is an appearance of matter like to that rejected by coughing, together with the ſymptoms now deſcribed, and particularly with great difficulty of breathing, and a ſenſe of ſtrangling in the fauces, by which the patient is ſometimes ſuddenly taken off.

Many diſſections have been made of infants who had died of this diſeaſe, and almoſt conſtantly there has appeared a preternatural ſubſtance, apparently membranous, lining the whole internal ſurface of the upper part of the trachea, and extending in the ſame manner downwards into ſome of its ramifications. This preternatural membrane may be eaſily ſeparated, and ſometimes has been found ſeparated in part, from the ſubjacent proper membrane of the trachea. This laſt is commonly found entire, that is, without any appearance of eroſion or ulceration; but it frequently ſhows the veſtiges of inflammation, and is covered by a matter reſembling pus, like to that rejected by coughing; and very often a matter of the ſame kind is found in the bronchiæ, ſometimes in conſiderable quantity.

From the remote cauſes of this diſeaſe; from the catarrhal ſymptoms commonly attending it, from the pyrexia conſtantly preſent with it; from the ſame kind of preternatural membrane being found in the trachea when the cynanche maligna is communicated to it; and from the veſtiges of inflammation on the trachea diſcovered upon diſſection; we muſt conclude, that this diſeaſe conſiſts in an inflammatory affection of the mucous membrane of the larynx and trachea, producing an exudation analogous to that found on the ſurface of inflamed viſcera, and appearing partly in a membranous cruſt, and partly in a fluid form reſembling pus.

Though this diſeaſe conſiſts in an inflammatory affection, it does not commonly end either in ſuppuration or gangrene. The troubleſome circumſtance of it ſeems to conſiſt in a ſpaſm of the muſcles of the glottis, threatening ſuffocation.

When this diſeaſe terminates in health, it is by reſolution of the inflammation, by ceaſing of the ſpaſm of the glottis, by an expectoration of the matter exuding from the trachea, and of the cruſts formed there, and frequently it ends without any expectoration, or at leaſt with ſuch only as attends an ordinary catarrh. But in ſome inſtances, a ſalutary termination has very ſpeedily taken place, in conſequence of the diſcharge of the membranous ſubſtance from the trachea, even under its proper tubular form.

When the diſeaſe ends fatally, it is by a ſuffocation ſeemingly depending upon a ſpaſm affecting the glottis; but ſometimes, probably, depending upon a quantity of matter filling the bronchiæ, or obſtructing the trachea.

As we ſuppoſe the diſeaſe to be an inflammatory affection, ſo we attempt the cure of it by the uſual remedies of inflammation. Bleeding, both general and topical, has often given immediate relief, and by being repeated, has entirely cured the diſeaſe. Bliſtering alſo, near to the part affected, has been found uſeful. Upon the firſt attack of the diſeaſe, vomiting, immediately after bleeding, ſeems to be of conſiderable uſe, and ſometimes ſuddenly removes the diſeaſe. But emetics are ſtill more uſeful in advanced periods. By the employment of theſe, the matter obſtructing the trachea, and inducing ſpaſmodic affections, has often been ſucceſsfully removed, when the ſituation of the patient ſeemed to be almoſt deſperate. And as in the progreſs of the diſeaſe freſh effuſions of this matter are very apt to take place, the frequent repetition of emetics becomes neceſſary. It is often neceſſary to have recourſe to thoſe operating the moſt expeditiouſly, ſuch as vitriolated zinc even in large doſes. In every ſtage of the diſeaſe, the antiphlogiſtic regimen is neceſſary, and particularly the frequent uſe of laxative glyſters. Though we ſuppoſe that a ſpaſm affecting the glottis is often fatal in this diſeaſe, antiſpaſmodic medicines have not in general been found of great ſervice. Some, however, have ſtrongly recommended the uſe of aſafœtida under the form of injection; others place great confidence in oil, or oily mixtures taken by the mouth: but more immediate benefit is derived from tepid bathing, and the employment of vitriolic ether, both externally and internally.

Sp. IV. CYNANCHE PHARYNGEA. 181

Cynanche pharyngea, *Sauv.* ſp. 6. *Eller* de cogn. et cur. ſect. 7.
Anginæ inflammatoriæ, ſp. 4. *Boerh.* 804.

This is not materially different from the cynanche tonſillaris; only that the inflammation is ſaid to begin in the pharynx, though Dr Cullen ſays he never knew an inſtance of it. The ſymptoms are almoſt the ſame, and the cure is preciſely ſo with that of the cynanche tonſillaris.

Sp. V. CYNANCHE PAROTIDÆA. 182

Cynanche parotidæa, *Sauv.* ſp. 14. *Gallis* OREILLONS et OURLES, *Tiſſot* Avis au peuple, n° 116. *Encyclopedie*, au mot *Oreillons*.
Angina externa, *Anglis* the MUMPS, *Ruſſel* œcon. natur. p. 114. *Scotis* the BRANKS.
Catarrhus Bellinſulanus, *Sauv.* ſp. 4.
Oſſervazioni di *Girol. Gaſpari*, Venez. 1731.
Oſſervazioni di *Targ. Tozetti*, Racolta 1 ma, p. 176.

This is a diſeaſe well known to the vulgar, but little taken notice of by medical writers. It is often epidemic, and manifeſtly contagious. It comes on with the uſual ſymptoms of pyrenia, which is ſoon after attended with a conſiderable tumour of the external fauces and neck. The ſwelling appears firſt as a glandular moveable tumour at the corner of the lower jaw; but it ſoon becomes uniformly diffuſed over a great part of the neck, ſometimes on one ſide only, but more commonly on both. The ſwelling continues to increaſe till the fourth day; but from that period it declines, and in a few days more goes off entirely. As the ſwelling of the fauces recedes, it not unfrequently happens that ſome tumour affects the teſticles in the male ſex, or the breaſts in the female. Theſe tumours are ſometimes large, hard, and ſomewhat painful; but are ſeldom either very painful or of long continuance. The pyrexia attending this diſeaſe is commonly ſlight, and goes off with the ſwelling of the fauces; but ſometimes, when the ſwelling of the teſticles does not ſucceed to that of the fauces, or when the one or the other has been ſuddenly repreſſed, the pyrexia becomes more conſiderable, is often attended with delirium, and has ſometimes proved fatal.

As this diſeaſe commonly runs its courſe without either dangerous or troubleſome ſymptoms, ſo it hardly requires any remedies. An antiphlogiſtic regimen, and avoiding cold, are all that will be commonly neceſſary. But when, upon the receding of the ſwellings, the pyrexia comes to be conſiderable, and threatens an affection of the brain, it will be proper, by warm fomentations,

mentations, to bring back the ſwelling; and by vomiting, bleeding, or bliſtering, to obviate the conſequences of its abſence.

183 GENUS XI. PNEUMONIA.

Febris pneumonica, *Hoffm.* II. 136.

184 Sp. I. PERIPNEUMONIA

Peripneumony, or Inflammation of the LUNGS.

Peripneumonia, *Sauv.* gen. 112. *Lin.* 34. *Vog.* 51. *Sag.* gen. 311. *Boerh.* 820. *Juncker* 67.
Peripneumonia pura ſive vera Auctorum, *Sauv.* ſp. 1.
Peripneumonia gaſtrica, *Sauv.* ſp. 11. *Morgagn.* de cauſ. et ſed. Epiſt. xx. art. 30, 31.
Peripneumonia catarrhalis, *Sauv.* ſp. 6.
Peripneumonia notha, *Sydenh.* ſect. 6. cap. 4. *Boerh.* 867. *Morgagni* de cauſ. et ſed. Epiſt. xxi. 11.—15.
Peripneumonia putrida, *Sauv.* ſp. 2.
Peripneumonia ardens, *Sauv.* ſp. 3.
Peripneumonia maligna, *Sauv.* ſp. 4.
Peripneumonia typhodes, *Sauv.*. ſp. 5.
Amphimerina peripneumonica, *Sauv.* ſp. 15.

185 Sp. II. PLEURITIS.

The *Pleuriſy*, or Inflammation of the PLEURA.

Pleuritis, *Sauv.* gen. 103. *Lin.* 27. *Vog.* 56. *Sag.* gen. 303. *Boerh.* 875. *Junck.* 67
Paraphreneſis, *Sauv* gen. 102. *Lin.* 26.
Paraphrenitis, *Vog.* 55. *Boerh.* 907.
Diaphragmitis, *Sag.* gen. 304.
Pleuritis vera, *Sauv.* ſp. 1. *Boerh.* 875. *Verna.* princepts morb. acut. pleuritas, l. 1. cap. 2. 3. *Zeviani* della parapleuritide, cap. 3. *Morgagni* de ſed. et cauſ. morb. Epiſt. xx. art. 56. xxi. 45. *Wendt* de pleuritide, apud *Sandifort*, theſ. ii.
Pleuritis pulmonis, *Sauv.* ſp. 2. *Zevian.* dell. parapleur. iii. 28, &c.
Pleuropneumonia, pleuro-peripneumonia, peripneumo-pleuritis Auctorum. *Baronius* de pleuri-pneumonia. Ill. *Halleri* opuſcul. patholog. obſ. 13. *Morgagni* de ſed. et cauſ. Epiſt. xx. and xxi. paſſim. *Cleghorn*, Minorca, p. 247. *Triller* de pleuritide, aph. 1, 2, 3 cap. i. 8. *Huxham*, Diſſert on pleuriſies, &c. chap. i. Ill. *Pringle*, Diſ. of the army.
Pleuritis convulſiva, *Sauv.* ſp. 13. *Bianch.* Hiſt. hep. vol. i. p. 234.
Pleuritis hydrothoracica. *Sauv.* ſp 15. *Morgagni* de cauſ. et ſed. xx. 34.
Pleuritis dorſalis, *Sauv.* ſp. 3. *Verna*, p. 3. cap. 8.
Pleuritis mediaſtini, *Sauv.* ſp. 3. *P. Sal. Div.* de affec. part. cap. 6. *Friend*, Hiſt. Med. de Avenzoare.
Mediaſtina, *Vog.* 52.
Pleuritis pericardii, *Sauv.* ſp. 5. *Verna*, p. iii. cap, 9.
Parapleuritis, *Zeviani* della parapleuritide.
Pleurodyne parapleuritis, *Sauv.* ſp. 19.
Paraphreneſis diaphragmatica, *Sauv.* ſp. 1. *De Haen.* Rat. med. i. 7. iii. p. 31.
Paraphreneſis pleuritica, *Sauv.* ſp. 2.
Paraphreneſis hepatica, *Sauv.* ſp. 3.

Under the general head of *Pneumonia*, Dr Cullen comprehends all inflammations of the thoracic viſcera, or membrane lining the inſide of that cavity; as the ſymptoms do not ſufficiently diſtinguiſh the ſeat of the affection, nor does a difference in the ſituation of the affected place make any difference in the cure.

Deſcription. Pneumonic inflammation, however various in the ſeat, always diſcovers itſelf by pyrexia, difficult breathing, cough, and pain in ſome part of the thorax. It almoſt always comes on with a cold ſtage, and is accompanied with the other ſymptoms of pyrexia; though in ſome few inſtances the pulſe may not be more frequent, nor the heat of the body increaſed beyond what is natural. Sometimes the pyrexia is from the beginning accompanied with the other ſymptoms; but frequently it is formed ſome hours before them, and particularly before the pain be felt. The pulſe for the moſt part is frequent, full, ſtrong, hard, and quick; but, in a few inſtances, eſpecially in the advanced ſtate of the diſeaſe, it is weak, ſoft, and at the ſame time irregular. The difficulty of breathing is moſt conſiderable in inſpiration, both becauſe the lungs do not eaſily admit of a full dilatation, and becauſe the dilatation increaſes the pain attending the diſeaſe. The difficulty of breathing is alſo greater when the patient is in one poſture of the body rather than another. It is generally greater when he lies on the ſide affected; though ſometimes the contrary happens. Very often the patient cannot lie eaſy upon either ſide, and can find eaſe only when lying on the back; and ſometimes he cannot breathe eaſily, except when in ſomewhat of an erect poſture. The cough, in different caſes, is more or leſs urgent or painful. It is ſometimes dry, or without any expectoration, eſpecially in the beginning of the diſeaſe; but more commonly it is, even from the beginning, moiſt, and the matter ſpit up various both in conſiſtence and colour, and frequently it is ſtreaked with blood. The pain is alſo different in different caſes, and felt in different parts of the thorax, but moſt frequently in one ſide. It has been ſaid to affect the right ſide more frequently than the left; but this is uncertain, and we are ſure that the left ſide has been very often affected. Sometimes it is felt as if it was under the ſternum; ſometimes in the back between the ſhoulders; and when in the ſides, its place has been higher or lower, more forward or backward; but the place of all moſt frequently affected is about the ſixth or ſeventh rib, near the middle of its length, or a little more forward. The pain is often ſevere and pungent; but ſometimes more dull and obtuſe, with a ſenſe of weight rather than of pain. It is moſt eſpecially ſevere and pungent when occupying the place laſt mentioned. For the moſt part it continues fixed in one part, but ſometimes ſhoots from the ſide to the ſcapula on one hand, or to the ſternum and clavicle on the other.

Dr Cullen ſuppoſes that the diſeaſe is always ſeated, or at leaſt begins, in ſome part of the pleura, taking that membrane in its greateſt extent, as now commonly underſtood; that is, as covering not only the internal ſurface of the cavity of the thorax, but alſo as forming the mediaſtinum, and as extended over the pericardium, and over the whole ſurface of the lungs. But as the ſymptoms never clearly indicate where the ſeat of the diſeaſe is, there is but little foundation for the different names by which it has been diſtinguiſhed. The term *pleuriſy* is improperly limited to that inflammation which begins in and chiefly affects the pleura coſtalis. This our author thinks is a rare occurrence; and that the pneunomia much more frequently begins in the pleura inveſting the lungs, producing all the ſymptoms which belong to what hath been called the *pleuritis vera*. The word *peripneumony* has been applied to an inflammation beginning in the parenchyma, or cellular texture of the lungs, and having its ſeat chiefly there. But to Dr Cullen it ſeems very doubtful if any acute inflammation of the lungs, or any diſeaſe which has been called *peripneumony*, be of that kind. It ſeems probable, that every acute inflammation begins in membranous parts; and in every diſſection of perſons who have died of peripneumony, the external membrane of the lungs, or ſome part of the pleura, has appeared to have been conſiderably affected. An inflammation of the pleura covering the upper ſurface of the diaphragm, has been diſtinguiſhed by the appellation of *paraphrenitis*, as ſuppoſed to be attended with the peculiar ſymptoms of delirium, *riſus ſardonicus*, and other convulſive motions: but it is certain, that an inflammation of that portion of the pleura, and affecting alſo even the muſcular ſubſtance of the diaphragm, has often taken place without any of the ſymptoms abovementioned; and neither the diſſections which have fallen under Dr Cullen's obſervation, nor any accounts of diſſections, ſupport the opinion that an inflammation of the pleura covering the diaphragm is attended with delirium more commonly than any other pneumonic inflammation.--- It is to be obſerved however, that though the inflammation may begin in one particular part of the pleura, the morbid affection is commonly communicated to the whole extent of the membrane.

The pneumonic inflammation, like others, may terminate by reſolution, ſuppuration or gangrene: but it has alſo a termination peculiar to itſelf; namely, when it is attended with an effuſion of blood into the cellular texture of the lungs, which, ſoon interrupting the circulation of the blood through the viſcus, produces a fatal ſuffocation. This indeed appears to be the moſt common termination of pneumonic inflammation when it ends fatally; for upon the diſſection of almoſt every perſon who has died of this diſeaſe, it appears that ſuch an effuſion had happened. From the ſame diſſections we learn, that pneumonic inflammation commonly produces an exſudation from the internal ſurface of the pleura, which appears partly as a ſoft viſcid cruſt, often of a compact membranous form, covering every where the ſurface of the pleura, and particularly thoſe parts where the lungs adhere to the pleura coſtalis, or mediaſtinum; and this cruſt ſeems always to be the cement of ſuch adheſion. The ſame exſudation ſhows itſelf alſo by a quantity of a ſerous fluid commonly found in the cavity of the thorax; and ſome exſudation or effuſion is uſually found to have been made into the cavity of the pericardium. It ſeems likewiſe probable, that an effuſion of this kind is ſometimes made into the cavity of the bronchiæ; for in ſome perſons who have died after labouring under a pneumonic inflammation for a few days only, the bronchiæ have been found filled with a conſiderable quantity of ſerous and thickiſh fluid, which muſt be conſidered rather as the effuſion abovementioned, having had its thinner parts taken off by reſpiration, than as a pus ſo ſuddenly formed in the inflamed part. It is, however, not improbable, that this effuſion, as well as that made into the cavities of the thorax and pericardium, may be a matter of the ſame kind with that which in other inflammations is poured into the cellular texture of the parts inflamed, and there converted into pus; but in the thorax and pericardium it does not always put on this appearance, becauſe the cruſt covering the ſurface prevents the abſorption of the thinner part. This abſorption, however, may be compenſated in the bronchiæ, by the drying power of the air; and therefore the effuſion into them may aſſume a more purulent appearance. In many caſes of pneumonic inflammation, when the expectoration is very copious, it is difficult to ſuppoſe that the whole proceeds from the mucous follicles of the bronchiæ; and it ſeems probable that a great part of it may come from the effuſed ſerous fluid juſt mentioned; and this too will account for the appearance of the expectoration being ſo often purulent. Perhaps the ſame thing will account for that purulent matter found in the bronchiæ, which Mr de Haen ſays he had often obſerved when there was no ulceration in the lungs, and which he accounts for in a very ſtrange manner, namely, by ſuppoſing a pus formed in the circulating blood.

Dr Cullen is of opinion, that the effuſion into the bronchiæ abovementioned often concurs with the effuſion of red blood into the cellular ſubſtance of the lungs to occaſion the fatal ſuffocation which frequently terminantes peripneumony: that the effuſion of ſerum alone may have this effect: and that the ſerum poured out in a certain quantity, rather than any debility in the powers of expectoration, is the cauſe of that ceſſation of ſpitting which precedes the fatal event; for in many caſes the expectoration has ceaſed, when no other ſymptoms of debility have appeared, and when, upon, diſſection, the bronchiæ have been full of liquid matter. Nay, it is even probable, that in ſome caſes ſuch an effuſion may take place without any ſymptoms of violent inflammation; and in other caſes the effuſion taking place may ſeem to remove the ſymptoms of inflammation which had appeared before, and thus account for thoſe unexpected fatal terminations which have ſometimes happened.

Pneumonic inflammation ſeldom terminates by reſolution, without being attended with ſome evident evacuation. An hæmorrhagy from the noſe happening on ſome of the firſt days of the diſeaſe has ſometimes put an end to it; and it is ſaid, that an evacuation from the hæmorrhoidal veins, a bilious evacuation by ſtool, and an evacuation of urine with a copious ſediment, have ſeverally had the ſame effect; but ſuch occurrences have been rare. The evacuation moſt frequently attending, and ſeeming to have the greateſt effect in promoting reſolution, is an expectoration of a thick, white, or yellowiſh matter, a little ſtreaked with blood, copious, and brought up without much or violent coughing. Very frequently the reſolution of this diſeaſe is attended with, and perhaps produced by, a ſweat which is warm, fluid, copious, over the whole body, and attended with an abatement of the frequency of the pulſe, heat of the body, and other febrile ſymptom. Although, from the hiſtory now given, it appears that pleuriſy and peripneumony cannot with propriety be conſidered as different diſeaſes, yet it is certain that in different caſes this affection occurs with an aſſemblage of ſymptoms ſeparate and diſtinct. Thus even Dr Cullen himſelf, in his Noſology, has defined pleuritis to conſiſt in pyrexia, attended with pungent pain of the ſide, painful reſpiration, difficulty of lying down particularly on the affected ſide, and diſtreſſing cough, in the begining dry, but afterwards humid, and often with bloody expectoration. While again he has defined peripneumony to conſiſt in pyrexia, attended with a dull pain under the ſternum and between the ſhoulders, anxiety, difficulty of breathing, humid cough, expectoration generally bloody, a ſoft pulſe, and a tumid livid appearance of the countenance. It is highly probable, that the firſt of theſe ſets of ſymptoms chiefly ariſes from a ſtate of active inflammation, and the ſecond from effuſion. Thus, in certain caſes the ſymptons may appear perfectly ſeperate and diſtinct; but more frequently both inflammation and effuſion are united; and thus the ſymptoms in both definitions are in general combined in the ſame patient.

Cauſes of, and perſons ſubject to, this diſorder. The remote cauſe of pneumonic inflammation is commonly cold applied to the body, obſtructing perſpiration, and determining to the lungs, while at the ſame time the lungs themſelves are expoſed to the action of cold. Theſe circumſtances operate chiefly when an inflammatory diatheſis, prevails in the ſyſtem; and therefore thoſe principally affected with the diſeaſe are perſons of the greateſt vigour, in cold climates, in the winter ſeaſon, and particularly in the ſpring, when viciſſitudes of heat and cold are frequent. This diſeaſe, however may ariſe in any ſeaſon when ſuch varieties take place. Other remote cauſes alſo may have a ſhare in producing this diſtemper; ſuch as every means of obſtructing ſtraining, or otherwiſe injuring, the pneumonic organs. The pneumonic inflammation has ſometimes been ſo much an epidemic, that it hath been ſuſpected of depending on a ſpecific contagion; but Dr Cullen never met with an inſtance of its being contagious.

Prognoſis. In pneumonic inflammations, a violent pyrexia is always dangerous. The danger, however is chiefly denoted by the difficulty of breathing. When the patient can lie on one ſide only; when he can lie on neither ſide, but only on his back; when he cannot breathe with tolerable eaſe, except when the trunk of his body is erect; when even in this poſture the breathing is very difficult, and attended with a turgeſcence and fluſhing of the face, partial ſweats about the head and neck, and an irregular pulſe; theſe circumſtances mark the difficulty of breathing in different degrees; and conſequently, in proportion, the danger of the diſeaſe. A frequent violent cough, aggravating the pain, is always the ſymptom of an obſtinate diſeaſe; and as the diſeaſe is ſeldom or never reſolved without ſome expectoration, ſo a dry cough muſt always be an unfavourable ſymptom.

The proper characteriſtics of the expectoration have been already laid down; and though an expectoration which has not theſe marks muſt indicate a doubtful ſtate of the diſeaſe, yet the colour alone can give no certain prognoſtic. An acute pain, very much interrupting inſpiration, is always the mark of a violent diſeaſe; but not of a more dangerous diſeaſe than an obtuſe pain attended with very difficult reſpiration.

When the pains, which had at firſt affected one ſide only, ſhall afterwards ſpread into the other; or when, leaving the ſide firſt affected, they paſs entirely into the other; theſe are always marks of a dangerous diſeaſe. A delirium coming on during a pneumonic inflammation is always a ſymptom denoting much danger.

When pneumonic diſorders teminate fatally, it is on one or other of the days of the firſt, week, from the third to the ſeventh. This is the moſt common caſe; but, in a few inſtances, death has happened at a later period. When the diſeaſe is violent, but admitting of reſolution, this alſo happens frequently in the courſe of the firſt week; but in a more moderate diſeaſe the reſolution is often put off to the ſecond week. The diſeaſe generally ſuffers a remiſſion on ſome of the days from the third to the ſeventh: which, however, may be often fallacious, as the diſeaſe ſometimes returns again with as much violence as before; and in ſuch a caſe with great danger. Sometimes it diſappears on the third day, while an eryſipelas makes its appearance on ſome external part; and if this continue fixed, the pneumonic inflammation does not recur. If the diſeaſe continue beyond the 14th day, it will terminate in a ſuppuration, or PHTHISIS. The termination by gangrene is much more rare than has been imagined: and when it does occur, it is uſually joined with the termination by effuſion; the ſymptoms of the one being hardly diſtinguiſhable from thoſe of the other.

Cure. This muſt proceed upon the general plan mentioned under SYNOCHA; but, on account of the importance of the part affected, the remedies muſt be employed early, and as fully as poſſible; and theſe are chiefly directed with one of three views, viz, for obtaining a reſolution of the inflammation in the thorax, for mitigating the urgent ſymptoms before a reſolution can be effected, and for counteracting or obviating the conſequences of the diſeaſe. Veneſection is the remedy chiefly to be depended on; and may be done in either arm, as the ſurgeon finds moſt convenient; and the quantity taken away ought in general to be as large as the patient's ſtrength will allow. The remiſſion of pain, and the relief of reſpiration, during the flowing of the blood, may limit the quantity to be then drawn; but if theſe ſymptoms of relief do not appear, the bleeding ſhould be continued to a conſiderable extent unleſs ſymptoms of a beginning ſyncope come on. It is ſeldom that one bleeding, however large, will cure this diſeaſe; and though the pain and difficulty of breathing may be much relieved by the firſt bleeding, theſe ſymptoms commonly and after no long interval recur, often with as much violence as before. In this caſe the bleeding is to be repeated even on the ſame day, and perhaps to the ſame quantity as before. Sometimes the ſecond bleeding may be larger than the firſt. There are perſons who, by their conſtitution, are ready to faint, even upon a ſmall bleeding; and in ſuch perſons this may prevent the drawing ſo much blood at firſt as a pneumonic inflammation may require: but as the ſame perſons are found to bear after bleedings better than the firſt, this allows the ſecond and ſubſequent bleedings to be larger, and to ſuch a quantity as the ſymptoms of the diſeaſe may ſeem to require.

Bleedings are to be repeated according to the ſtate of the ſymptoms, and they will be more effectual when practiſed in the courſe of the firſt three days than afterwards; but they are not to be omitted though four days of the diſeaſe may already have elapſed. If the phiſician has not been called in time, or the firſt bleedings have not been ſufficiently large, or even though they ſhould have procured ſome remiſſion, yet upon the return of the urgent ſymptoms, bleeding may be repeated at any time within the firſt fortnight, or even after that period, if a ſuppuration be not evident, or if after a ſeeming ſolution the diſeaſe ſhall have returned.

With reſpect to the quantity of blood which may be taken away with ſafety, no general rules can be given; as it muſt be very different according to the ſtate of the diſeaſe, and the conſtitution of the patient. In an adult male of tolerable ſtrength a pound avoirdupois of blood is a full bleeding. Any quantity above 20 ounces is a large, and any quantity below 12 is a ſmall, bleeding. An evacuation of four or five pounds in the courſe of two or three days, is generally as much as moſt patients will bear; but if the intervals between the bleedings, and the whole of the time during which the bleedings have been employed, have been long the quantity taken upon the whole may be greater.

When a large quantity of blood hath been taken from the arm, and it is doubtful if more can be taken in that manner with ſafety, ſome blood may ſtill be taken by cupping and ſcarifying. This will eſpecially be proper, when the recurrence of the pain, rather than the difficulty of breathing, becomes the urgent ſymptom; and then the cupping and ſcarification ſhould be made as near as poſſible to the pained part.

An expectoration ſometimes takes place very early in this diſeaſe; but if the ſymptoms continue urgent, the bleedings muſt be repeated notwithſtanding the expectoration: but in a more advanced ſtate, and when the ſymptoms have ſuffered a conſiderable remiſſion, we may then truſt the cure to the expectoration alone. It is not obſerved that bleeding, during the firſt days of the diſeaſe, ſtops expectoration; on the contrary, it hath been often found to promote it; and it is only in a more advanced ſtate of the diſeaſe, when the patient has been already exhauſted by large evacuations and a continuance of his illneſs, the bleeding ſeems to put a ſtop to expectoration; and even then, this ſtoppage ſeems not to take place ſo much from the powers of expectoration being weakened by bleeding, as by its favouring the ſerous effuſion in the bronchiæ, already taken notice of.

Beſides bleeding, every part of the antiphlogiſtic regimen ought here to be carefully employed: the patient muſt keep out of bed as much as he can bear; muſt have plenty of warm diluting drinks, impregnated with vegetable acids, accompanied with nitre or ſome other cooling neutral ſalt: and the belly alſo ought to be kept open by emollient glyſters or cooling laxative medicines. Vomiting in the beginning is dangerous; but in a ſomewhat advanced ſtate of the diſeaſe emetics have been found the beſt means of promoting expectoration. Fomentations and poultices to the pained part have been found uſeful; but bliſtering is found to be much more effectual. A bliſter, however, ought not to be applyed till at leaſt one bleeding hath been premiſed, as veneſection is leſs effectual when the irritation of a bliſter is preſent. If the diſeaſe be moderate, a bliſter may be applied immediately after the firſt bleeding; but in violent caſes, where it may be preſumed that a ſecond bleeding may ſoon be neceſſary after the firſt, it will be proper to delay the bliſter till after the ſecond bleeding, when it may be ſuppoſed that the irritation occaſioned by the bliſter will be over before another bleeding becomes neceſſary. It may frequently be of uſe in this diſeaſe to repeat the bliſtering; and in that caſe the plaſters ſhould always be applied ſomewhere on the thorax, for when applied to more diſtant parts they have little effect. The keeping the bliſtered parts open, and making what is called a *perpetual bliſter*, has much leſs effect than a repeated bliſtering.

Many methods have been propoſed for promoting expectoration, but none appear to be ſufficiently effectual; and ſome of them, being acrid ſtimulant ſubſtances, are not very ſafe. The gums uſually employed ſeem to be too heating; the ſquills leſs ſo; but they are not very powerful, and ſometimes inconvenient, by the conſtant nauſea they occaſion. The volatile alkali may be of ſervice as an expectorant, but it ought to be reſerved for an advanced ſtate of the diſeaſe. Mucilaginous and oily demulcents appear to be uſeful, by allaying that acrimony of the mucus which occaſions too frequent coughing; and which coughing prevents the ſtagnation and thickening of the mucus, and thereby its becoming mild. The receiving into the lungs the ſteams of warm water, impregnated with vinegar, has often proved uſeful in promoting expectoration; and, for this purpoſe, the machine called the INHALER, lately invented by Dr Mudge of Plymouth, promiſes to be of great ſervice. But of all others, the antimonial emetics given in nauſeating doſes, promiſe to be the moſt powerful for promoting expectoration. The kermes mineral has been greatly recommended; but doth not ſeem to be more efficacious than emetic tartar or antimonial wine; and the doſe of the kermes is much more uncertain than that of the others.

Though this diſeaſe often terminates by a ſpontaneous ſweating, the evacuation ought not to be excited by art, unleſs with much caution. When, after ſome remiſſion of the ſymptoms, ſpontaneous ſweats ariſe, they may be encouraged; but it ought to be without much heat, and without ſtimulant medicines. If, however, the ſweats be partial and clammy only, and a great difficulty of breathing ſtill remain, it will be very dangerous to encourage them.

Phyſicians have differed much with regard to the uſe of opiates in pneumonic affections. it appears, however, that, in the beginning of the diſeaſe, and before bleeding and bliſtering have produced ſome remiſſion of the pain, and of the difficulty of breathing, opiates have a bad tendency, by their increaſing the difficulty of breathing and other inflammatory ſymptoms. But in a more advanced ſtate of the diſeaſe, when the difficulty of breathing has abated, and when the urgent ſymptom is a cough, proving the chief cauſe of the continuance of pain and want of

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Phlegmaſiæ. reſt, opiates may be employed with great advantage and ſafety. The interruption of the expectoration which they ſeem to occaſion, is for a ſhort time only; and they ſeem often to promote it, as they occaſion a ſtagnation of what was by frequent coughing diſſipated inſenſibly: and therefore give the appearance of what phyſicians have called *concocted matter*.

Opium combined with calomel has of late been highly extolled in this and other inflammatory diſeaſes by Dr Hamilton of Lynn-Regis; who has given a full account of the ſucceſs attending his practice with this remedy, for the ſpace of 16 years, in the 9th volume of the Edinburgh Medical Commentaries. And ſince his recommendation, the ſame remedy has often been employed by others with great benefit.

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Vomica, or *Abſceſs* of the *Lungs*.

Vomica, *Boerh.* 835, *Junck.* 35.
Pleurodyne vomica, *Sauv.* ſp. 21.

This ſometimes follows pneumonia, though the caſe is not frequent. The ſymptoms of it ſo much reſemble the phthiſis, that it can moſt properly be treated of under that head.

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Empyema.

This is another conſequence of a pneumonia terminating unfavourably, and is occaſioned by the effuſion of a quantity of purulent mattter into the cavity of the thorax, producing a lingering and painful diſorder, very often incurable.

Deſcription. The firſt ſign of an empyema is a ceſſation of the pain in the breaſt, which before was continual: this is followed by a ſenſation of weight on the diaphragm; and a fluctuation of matter, ſometimes making a noiſe that may be heard by the by-ſtanders: the acute fever is changed into a hectic, with an exacerbation at night: a continual and troubleſome dry cough remains. The reſpiration is exceedingly difficult, becauſe the lungs are prevented by the matter from fully expanding themſelves. The patient can lie eaſily on that ſide where the matter is effuſed, but not on the other, becauſe then the weight of the matter on the mediaſtinum produces uneaſineſs. The more the hectic heat is augmented, the more is the body emaciated, and its ſtrength decayed. In ſome there is danger of ſuffocation when they ſtoop down, which goes off when they alter that poſture of the body; and in ſome there is a purulent ſpitting.—These ſymptoms are accompanied with great anxiety, palpitations of the heart, and faintings. Sometimes the patients have a ſenſation like a hot vapour aſcending from the cavity of the thorax to their mouth. Others, in a more advanced ſtate of the diſeaſe, have a putrid taſte in the mouth. At the ſame time, profuſe night-ſweats waſte the body, and greatly weaken the patient. The face at firſt grows red on that ſide where the matter lies, at laſt the Hippocratic face comes on, and the eyes become hollow. The pulſe, eſpecially on the affected ſide, is quick, but more frequently intermitting. Sometimes the nails are crooked, and puſtules appear on the thorax; and frequently, according to the teſtimony of Hippocrates, the feet ſwell, and, on the affected ſide of the breaſt, there is an inflation and ſwelling of the ſkin.

Cauſes, &c. An empyema may ariſe either from Empyema. the burſting of a vomica of the lungs, or from a ſuppuration taking place after the inflammatory ſtage of the pneumonia; or ſometimes from a ſuppuration in the caſe of a quinſy, when the inflammation had extended to the aſpera arteria, from whence ariſes a kind of bloody ſpittle, and the patients are afflicted with an empyema, unleſs they die on the 7th day of the diſeaſe, according to the obſervation of Hippocrates. It may ariſe alſo from external violence, as wounds of the thorax, &c. blood extravaſated, corrupted, or changed into pus. Like the vomica, it is a rare diſtemper, but may attack all thoſe ſubject to pneumonia.

Prognoſis. Very few recover after an empyema has been once formed, eſpecially if the operation of paracenteſis be neglected. After this operation is performed, if a great quantity of bloody fetid pus be diſcharged, if the fever continue, and if the patient ſpit up a purulent, pale, frothy, livid, or green matter, with a decay of ſtrength, there is no hope: But when a ſmall quantity of pus, of a white colour, not very fetid, is diſcharged; when the fever and thirſt preſently ceaſe, the appetite returns, and fæces of a good conſiſtence are diſcharged, the ſtrength alſo returning in ſome degree, there is then hope of a perfect recovery. If the matter be not dried up in ſeven weeks time, the diſeaſe readily changes to a fiſtulous ulcer which is very difficult to cure. An empyema affecting both ſides of the thorax is more dangerous than that which affects only one.

Cure. This conſiſts in evacuating the purulent matter contained in the cavity of the thorax, which is beſt done by the operation of paracenteſis. See the article SURGERY. Afterwards the ulcer is to be treated with abſtergent and conſolidating medicines, and the ſame internal ones are to be given as in a PHTHISIS.

Gen. XIII. CARDITIS. 18

Inflammation of the HEART.

Carditis, *Sauv.* gen. 111. *Vog.* 54.
Pericarditis, *Vog.* 53.
Carditis ſpontanea, *Sauv.* ſp. 1. *Senac.* Traitè de Cœur, lib. iv. chap. 7. *Meckel*, Mem. de Berlin, 1756.
Eryſipelas pulmonis, *Lomm.* Obſerv. lib. ii.

Deſcription. This diſeaſe is attended with all the ſymptoms of pneumonia, but in a higher degree; it is beſides ſaid to be accompanied with hydrophobic ſymptoms, fainting, palpitation of the heart, a ſeeming madneſs, a ſunk and irregular pulſe, watery eyes, and a dejected countenance, with a dry and black tongue. On diſſection, the heart and pericardium are found very much inflamed, and even ulcerated, with many polypous concretions.

Cauſes, &c. The ſame as in the pneumonia.

Prognoſis. In the carditis the prognoſis is more unfavourable than in the pneumonia; and indeed, unleſs the diſeaſe very quickly terminates, it muſt prove fatal, on account of the conſtant and violent motion of the heart, which exaſperates the inflammation, and increaſes all the ſymptoms.

Cure. Here bleeding is neceſſary in as great a

Phlegmaſiæ degree as the patient can poſſibly bear, together with bliſtering, and the antiphlogiſtic regimen likewiſe carried to a greater height than in the pneumonia; but the general method is the ſame as in other inflammatory diſeaſes.

189 Genus XIV. PERITONITIS.
Inflammation of the Peritonæum.

Sp. I. *Inflammation of the* Peritonæum properly ſo called.

Peritonitis, *Vog.* 62. *Lieutad.* Hiſt. anat. med. lib. i. obſ. 3. *Raygerus* apud eund. lib. i.. obſ. 341. *Morgagn.* de ſed. LVII. 20.

190 Sp. II. *Inflammation of the* Peritonæum extended over the *Omentum.*

Epiploitis, *Sauv.* gen. 106. *Sag.* gen. 308.
Omentitis, *Vog.* 61.
Omenti inflammatio, *Boerh.* 958. et Ill. *Van Swieten,* Comm. *Stork.* An. Med. I. 132. *Hulme* on the puerperal fever.

191 Sp. III. *Inflammation of the* Peritonæum ſtretched over the *Meſentery.*

Meſenteritis, *Vog.* 60.
Enteritis meſenterica, *Sauv.* ſp. 4.

192 Genus XV. GASTRITIS.
Inflammation of the Stomach.

A. *Gastritis Phlegmonodæa,* or the *genuine Gaſtritis.*

Gaſtritis legitima, *Sauv.* ſp. 1. *Eller.* de cogn. et cur. morb. ſect. xii. *Haller.* obſ. 14. hiſt. 3.
193 *Lieut.* Hiſt. anat. Med. lib. 1. 74.
Gaſtritis eryſipelatoſa, *Sauv.* ſp. 4.
Cardialgia inflammatoria, *Sauv.* ſp. 13. *Tralles,* de opio ſect. ii. p. 231.

These diſeaſes Dr Cullen has thought proper to conſider all under the general head Gastritis, as there are no certain ſigns by which they can be diſtinguiſhed from each other, and the method of cure muſt be the ſame in all.

Deſcription. The inflammation of the ſtomach is attended with great heat and pain in the epigaſtric region, extreme anxiety, and almoſt continual and painful hiccough, with a moſt painful vomiting of every thing taken into the ſtomach. Sometimes a temporary madneſs enſues; and there is an inſtance in the Edinburgh Medical Eſſays of the diſorder being attended with an hydrophobia. The pulſe is generally more ſunk than in other inflammations, and the fever inclines to the nature of a typhus. The diſorder is commonly of the remitting kind, and during the remiſſions the pulſe frequently intermits. During the height of the diſeaſe, a mortal phrenzy frequently ſupervenes. The diſeaſe terminates on the fourth, ſeventh, or ninth day, or from the eleventh to the fifteenth; and is more apt to end in a gangrene than pneumonic inflammations, and more frequently in a ſcirrhus than in an abſceſs.

Cauſes, &c. The inflammation of the ſtomach may ariſe from any acrid ſubſtance taken into it; from a vehement paſſion; too large draughts of cold liquor, eſpecially when the perſon is very hot; from a ſurfeit; a ſtoppage of perſpiration; repulſion of the gout; inflammations of the neighbouring viſcera; or from external injuries, ſuch as wounds, contuſions, &c.—It affects chiefly thoſe of a plethoric habit and hot bilious conſtitution. Gaſtritis.

Prognoſis. This diſeaſe is always very dangerous, and the prognoſis doubtful, which alſo muſt always be in proportion to the ſeverity of the ſymptoms. A ceſſation of pain, coldneſs about the præcordia, great debility, with a languid and intermitting pulſe, with an abatement of the hiccough, denote a gangrene and ſpeedy death. From the ſenſibility of the ſtomach alſo, and its great connection with the reſt of the ſyſtem, it muſt be obvious, that an inflammation of it, by whatever cauſes produced, may be attended with fatal conſequences; particularly, by the great debility it produces, it may prove ſuddenly fatal, without running through the uſual courſe of inflammations.—Its tendency to admit of reſolution may be known by its having ariſen from no violent cauſe, by the moderate ſtate of the ſymptoms, and by a gradual remiſſion of theſe ſymptoms in the courſe of the firſt or at moſt of the ſecond week of the diſeaſe. The tendency to gangrene may be ſuſpected from the ſymptoms continuing with unremitting violence notwithſtanding the uſe of proper remedies, and a gangrene already begun may be known by the ſymptoms abovementioned, particularly great debility and ſudden ceſſation of pain. The tendency to ſuppuration may be known by the ſymptoms continuing but in a moderate degree for more than one or two weeks, and by a conſiderable remiſſion of the pain while a ſenſe of weight and anxiety ſtill remain. When an abſceſs has been formed, the frequency of the pulſe is firſt abated: but ſoon after it increaſes, with frequent cold ſhivering, and an exacerbation in the afternoon and evening; followed by night-ſweats, and other ſymptoms of hectic fever. Theſe at length prove fatal, unleſs the abſceſs open into the cavity of the ſtomach, the pus be evacuated by vomiting, and the ulcer ſoon healed.

Cure. It appears from diſſections, that the ſtomach may very often be inflamed when the characteriſtic marks of it have not appeared; and therefore we are often expoſed to much uncertainty in the cure. But when we have ſufficient evidence that a ſtate of active inflammation has taken place in the ſtomach, the principal object to be aimed at is to obtain a reſolution. Before, however, this can be accompliſhed, it will often be neceſſary to employ meaſures with the view of obviating urgent ſymptoms. When the ſymptoms appear in the manner above deſcribed, the cure is to be attempted by large and repeated bleedings employed early in the diſeaſe; and from theſe we are not to be deterred by the weakneſs of the pulſe, for it will commonly become fuller and ſofter after the operation. A bliſter ought alſo to be applied to the region of the ſtomach; and the cure will be aſſiſted by fomentations of the whole abdomen, and by frequent emollient and laxative glyſters. The irritability of the ſtomach in this diſeaſe will admit of no medicines being thrown into it; and if any can be ſuppoſed neceſſary, they muſt be exhibited in glyſters. Diluting drinks may be tried; but they muſt be of the very mildeſt kind, and given in very ſmall quantities at a time. Opiates, in whatever manner exhibited, cannot be retained in the ſtomach during the firſt days of the diſeaſe; but when the violence of the diſeaſe ſhall have abated, and when the pain and vomiting recur at intervals only, opiates given in glyſters may frequently be employed with advantage; and after bleeding and bliſters no remedy is more effectual either in allaying the pain or vomiting. As ſoon as the ſtomach will retain any laxative, gentle refrigerant cathartics, taken by the mouth, ſuch as the ſoda phoſphorata, ſoda tartariſata, or the like, are productive of great benefit. A tendency to gangrene in this diſeaſe is to be obviated only by the means juſt now mentioned; and when it does actually ſuppervene, it admits of no remedy. A tendency to ſupuration is to be obviated by the ſame means employed early in the diſeaſe. After a certain period it cannot be prevented by any means whatever; and, when actually begun, muſt be left to nature; the only thing that can be done by art being to avoid all irritation.

194 B. *Gastritis Erysipelatosa*, or the *Eryſipelatous Gaſtritis*.

Deſcription. This ſpecies of inflammation takes place in the ſtomach much more frequently than the former. From diſſections it appears that the ſtomach has been often affected with inflammation, when neither pain nor fever had given any notice of it; and ſuch is juſtly looked upon to have been of the eryſipelatous kind. This kind of inflammation alſo is eſpecially to be expected from acrimony of any kind applied to the ſtomach; and would certainly occur much more frequently, were not the interior ſurface of this organ commonly defended by mucus exſuding in large quantity from the numerous follicles placed immediately under the villous coat. On many occaſions, however, the exſudation of mucus is prevented, or the liquid poured out is of a leſs viſcid kind, ſo as to be leſs fitted to defend the ſubjacent nerves; and it is in ſuch caſes that acrid matters may readily produce an eryſipelatous affection of the ſtomach.

In many caſes, however, this kind of inflammation cannot be diſcovered, as it takes place without pain, pyrexia, or vomiting: but in ſome caſes it may; namely, when it ſpreads into the œſophagus, and appears on the pharynx and on the whole internal ſurface of the mouth. When therefore an eryſipelatous inflammation affects the mouth and fauces, and there ſhall be at the ſame time in the ſtomach an unuſual ſenſibility to all acrids, and alſo a frequent vomiting there can be little doubt of the ſtomach's being affected in the ſame manner. Even when no inflammation appears in the fauces, if ſome degree of pain be felt in the ſtomach, if there be a want of appetite, an anxiety and frequent vomiting, an unuſual ſenſibility with regard to acrids, ſome thirſt, and frequency of pulſe, there will then be room to ſuſpect an inflammation in the ſtomach; and ſuch ſymptoms, after ſome time, have been known to diſcover their cauſe by the inflammation riſing to the fauces or mouth. Inflammation of this kind is often diſpoſed to paſs from one place to another on the ſame ſurface, and, in doing ſo, to leave the place it had at firſt occupied. Such an inflammation has been known to ſpread ſucceſſively along the whole tract of the alimentary canal; occaſioning, when in the inteſtines, diarrhœa, and in the ſtomach vomitings; the diarrhœa ceaſing when the vomitings came on, and the vomitings on the coming on of the diarrhœa.

Cauſes, &c. An eryſipelatous inflammation may ariſe from acrid matters taken into the ſtomach; or from ſome internal cauſes not yet well known. It frequently occurs in putrid diſeaſes, and in thoſe recovering from fevers.

Cure. When the diſeaſe is occaſioned by acrid matters taken internally, and theſe may be ſuppoſed ſtill preſent in the ſtomach, they are to be waſhed out by drinking a large quantity of warm and mild medicines, and exciting vomiting. At the ſame time, if the nature of the acrimony and its proper corrector be known, this ſhould be thrown in; or if a ſpecific corrector be not known, ſome general demulcents ſhould be employed.

Theſe meaſures, however, are more ſuited to prevent than to cure inflammation after it has taken place. When this laſt may be ſuppoſed to have happened, if it be attended with a ſenſe of heat, with pain and pyrexia, according to the degree of theſe ſymptoms, the meaſures propoſed for the cure of the other kind are to be more or leſs employed. When an eryſipelatous inflammation of the ſtomach has ariſen from internal cauſes, if pain and pyrexia occur, bleeding may be employed in perſons not otherwiſe weakened; but in caſe of its occurring in putrid diſeaſes, or where the patients are already debilitated, bleeding is inadmiſſible; all that can be done being to avoid irritation, and only throwing into the ſtomach what quantity of acids and aceſcent aliments it ſhall be found able to bear. In ſome conditions of the body in which this diſeaſe is apt to occur, the Peruvian bark and bitters may ſeem to be indicated; but an eryſipelatous ſtate of the ſtomach will ſeldom allow them to be uſed.

Genus XVI. ENTERITIS, 195

Inflammation of the *Inteſtines*.

Enteritis, *Sauv.* gen. 105. *Lin.* 29. *Vog.* 57. *Sag.* gen. 307.
Inteſtinorum inflammatio, *Boerh.* 959.
Febris inteſtinorum inflammatoria ex meſenterio, *Hoffm.* II. 170.

Sp. I. *Enteritis Phlegmonodæa*, or the *Acute Enteritis* 196

Enteritis iliaca, *Sauv.* ſp. 1.
Enteritis colica, *Sauv.* ſp. 2. *Boerh.* 963.

Deſcription. This diſeaſe ſhows itſelf by a fixed pain in the abdomen, attended with fever, vomiting, and coſtiveneſs. The pain is often felt in different parts of the abdomen, but more frequently ſpreads over the whole, and is particularly violent about the navel.

Cauſes, &c. Inflammations of the inteſtines may ariſe from the ſame cauſes as thoſe of the ſtomach; though commonly the former will more readily occur from cold applied to the lower extremities, or to the belly itſelf. It is alſo found ſupervening on the ſpaſmodic colic, incarcerated hernia, and volvulus.

Prognoſis. Inflammations of the inteſtines have the ſame terminations with thoſe of the ſtomach, and the prognoſis in both caſes is much the ſame.

Cure. The cure of enteritis is in general the ſame with that of gaſtritis: but in this diſeaſe there is commonly more opportunity for the introduction of liquids, of acid, aceſcent, and other cooling remedies, and even of laxatives; but as a vomiting frequently attends the enteritis, care muſt be taken not to excite that vomiting by the quantity or quality of any thing thrown into the ſtomach. With regard to the ſuppuration and gangrene of the inteſtines following the enteritis, the obſervations, made reſpecting theſe terminations of gaſtritis are equally applicable in this diſeaſe.

197 Sp. II. *Enteritis Erysipelatosa*, or *Eryſipelatous Enteritis*.

Concerning this nothing farther can be ſaid, than what hath been already delivered concerning the gaſtritis.

198 Genus XVII. HEPATITIS.

Inflammation of the Liver.

Hepatitis, *Sauv.* gen. 113. *Lin.* 35. *Vog.* 58. *Sag.* gen. 312. *Boerh.* 914. *Hoffm.* II. 14. *Junck.* 66.

Deſcription. The inflammation of the liver is thought to be of two kinds, acute and chronic; but the latter very often does not diſcover itſelf except by an abſceſs found in the liver after death, and which is ſuppoſed to have been occaſioned by ſome degree of inflammation; for this reaſon the chronic inflammation often eſcapes obſervation, and we ſhall here only treat of the acute hepatitis.

The acute hepatitis is attended with conſiderable fever; a frequent, ſtrong, and hard pulſe; high coloured urine; an acute pain in the right hypochondrium, increaſed by preſſing upon the part. The pain is very often in ſuch a part of the ſide as to make it appear like a pleuriſy; and frequently, like that, is increaſed on inſpiration. The diſeaſe is alſo commonly attended with a cough, which is generally dry, but ſometimes moiſt; and when the pain thus reſembles a pleuriſy, the patient cannot lie eaſily except upon the ſide affected. The pain is frequently extended to the clavicle, and to the top of the ſhoulder; and is attended ſometimes with hiccough, and ſometimes with vomiting. Some have added jaundice, or a yellowneſs of the eyes, to the ſymptoms of this diſtemper; but experience ſhows that it has often occurred without any ſuch ſymptom.

When hepatitis is of the chronic kind, depending more on the accumulation and effuſion in the liver than in an increaſed action of its ſmall veſſels, the patient complains rather of a ſenſe of weight than of pain; and the fever is by no means either acute, or conſtant: but it often returns in paroxyſms ſomewhat reſembling the attacks of an intermittent. This diſeaſe is very ſlow in its progreſs, frequently continuing for many months, and at laſt terminating in a very conſiderable ſuppuration. In moſt caſes however, it may be diſcovered by careful examination of the region of the liver externally. By this means, a conſiderable enlargement of that viſcus may in general be diſcovered.

Cauſes, &c. The remote cauſes of hepatitis are not always to be diſcerned, and many have been aſſigned on a very uncertain foundation. It has been ſuppoſed that the diſeaſe may be an affection either of the extremities of the hepatic artery, or thoſe of the vena portarum; and the ſuppoſition is by no means improbable. The opinion, however, moſt commonly adopted is, that the acute hepatitis is an affection of the external membrane of the liver, and the chronic kind an affection of the parenchyma of that viſcus. The acute diſeaſe may be ſeated either on the convex or concave ſurface of the liver; and in the former caſe a more pungent pain and hiccough may be produced, and the reſpiration is more conſiderably affected. In the latter there occurs leſs pain; and a vomiting is produced, commonly by ſome inflammation communicated to the ſtomach. The inflammation on the concave ſurface of the liver may be readily communicated to the gall-bladder and biliary ducts: and this, perhaps, is the only caſe of idiopathic hepatitis attended with jaundice.

Prognoſis. The inflammation of the liver, like others, may end by reſolution, ſuppuration, or gangrene; and the tendency to the one or to the other of thoſe events may be known from what has been already mentioned concerning the prognoſis in gaſtritis. The reſolution of hepatitis is often the conſequence of or is attended with, evacuations of different kinds. A hæmorrhage, ſometimes from the noſe, and ſometimes from the hæmorrhoidal veſſels, gives a ſolution of the diſeaſe. Sometimes the ſame thing is accompliſhed by a bilious diarrhœa; and ſometimes the reſolution is attended with ſweating, and an evacuation of urine depoſiting a copious ſediment. Sometimes it may be cured by an eryſipelas appearing in ſome external part. When the diſeaſe has ended in ſuppuration, the pus collected may be diſcharged by the biliary ducts; or, if the ſuppurated part does not adhere any where cloſely to the neighbouring parts, it may be diſcharged into the cavity of the abdomen: but if, during the firſt ſtate of inflammation, the affected part of the liver ſhall have formed a cloſe adheſion to ſome of the neighbouring parts, the diſcharge after ſuppuration may be various, according to the different ſeat of the abſceſs. When ſeated on the convex part of the liver, if the adheſion be to the peritonæum lining the common teguments, the pus may make its way through theſe, and be diſcharged outwardly: or if the adheſion ſhall have been to the diaphragm, the pus may penetrate through this, and into the cavity of the lungs; from whence it may be diſcharged by coughing. When the abſceſs is ſeated on the concave part of the liver, in conſequence of adheſions, the pus may be diſcharged into the ſtomach or inteſtines; and into theſe laſt, either directly, or by the intervention of the biliary ducts. Upon a conſideration of all theſe different circumſtances therefore, together with the general principles of inflammation, muſt the prognoſis of this diſeaſe be eſtabliſhed.

Cure. For the cure of hepatitis, we muſt have recourſe to the general means of removing other inflammatory diſorders. Bleeding is to be uſed according to the degree of fever and pain. Bliſters are to be applied: fomentations of the external parts, emollient glyſters, gentle laxatives, diluents and refrigerants, are alſo uſeful. The cure, however, particularly in warm climates, where the diſeaſe is much more common than it is in Britain, is chiefly truſted to mercury. Not only in caſes of the chronic kind, but in acute hepatitis alſo, after an attempt has been made to alleviate the urgent ſymptoms by bleeding and bliſtering, recourſe is immediately had to this powerful mineral. It is employed by different practitioners, and in different caſes, under various forms. Some are very fond of the uſe of calomel. But the preference is in general given, and perhaps with juſtice, to friction with mercurial ointment over the region of the liver. But under whatever form it may be employed, it is neceſſary that it ſhould be introduced to ſuch an extent as to keep the patient on the verge of ſalivation for ſome length of time; the duration being regulated by the circumſtances of the caſe.

From the liberal uſe of mercury, there can be no doubt that a ſucceſsful reſolution has been obtained in many caſes, which would otherwiſe have infallibly terminated in ſuppuration. But notwithſtanding the moſt careful employment of it in ſome caſes, ſuppuration will enſue; and then it is very doubtful whether any benefit will be derived from the continuance of it. But when a ſuppuration has been formed, and the abſceſs points outwardly, the part muſt be opened, the pus evacuated, and the ulcer healed according to the ordinary methods in uſe for healing abſceſſes and ulcers in other parts.

199 Genus XVIII. SPLENITIS.

Inflammation of the Spleen.

Splenitis, *Sauv.* gen. 114. *Lin.* 36. *Vog.* 59. *Junck.* 67. *Sag.* gen. 313.
Lienis inflammatio, *Boerh.* 958. & *Van Swieten.* Comm.
Splenitis phlegmonodæa, *Sauv.* ſp. 1. *Foreſt*, l. xx. obſ. 5. 6. *De Haen*, apud *Van Swieten*, p. 958.
Pleuritis ſplenica, *Sauv.* ſp. 19.
Splenalgia ſuppuratoria, *Sauv.* ſp. 3.

Deſcription. This diſeaſe, according to *Juncker*, comes on with a remarkable ſhivering ſucceeded by a moſt intenſe heat and very great thirſt; a pain and tumor are perceived in the left hypochondrium, and the paroxyſms for the moſt part aſſume a quartan form. When the patients expoſe themſelves for a little to the free air, their extremities immediately grow very cold. If an hæmorrhagy happens, the blood flows out of the left noſtril. The other ſymptoms are the ſame with thoſe of the hepatitis. Like the liver, the ſpleen often is alſo ſubject to a chronic inflammation, which often happens after agues, and is called the *ague cake*, though that name is alſo frequently given to a ſcirrhous tumour of the liver ſucceeding intermittents.

Cauſes, &c. The cauſes of this diſtemper are in general the ſame with thoſe of other inflammatory diſorders; but thoſe which determine the inflammation to that particular part more than another, are very much unknown. It attacks perſons of a very plethoric and ſanguine habit of body rather than others.

Prognoſis. What has been ſaid of the inflammation of the liver applies alſo to that of the ſpleen, tho' the latter is leſs dangerous than the former. Here alſo a vomiting of black matter, which in other acute diſeaſes is ſuch a fatal omen, ſometimes proves critical, according to the teſtimony of Juncker. Sometimes the hæmorrhoids prove critical; but very often the inflammation terminates by ſcirrhus.

Cure. This is not at all different from what has been already laid down concerning the hepatitis.

200 Genus XIX. NEPHRITIS.

Inflammation of the Kidneys.

Nephritis, *Sauv.* gen. 115. *Lin.* 37. *Vog.* 65. *Sag.* gen. 314.
Nephritis vera, *Sauv.* ſp. 1.

Deſcription. The nephritis has the ſame ſymptoms in common with other inflammations; but its diſtinguiſhing mark is the pain in the region of the kidney, which is ſometimes obtuſe, but more frequently pungent. The pain is not increaſed by the motion of the trunk of the body ſo much as a pain of the rheumatic kind affecting the ſame region. It may alſo frequently be diſtinguiſhed by its ſhooting along the courſe of the ureter, and it is often attended with a drawing up of the teſticle, and a numbneſs of the limb on the ſide affected; though indeed theſe ſymptoms moſt commonly attend the inflammation ariſing from a calculus in the kidney or ureter. The diſeaſe is alſo attended with frequent vomiting, and often with coſtiveneſs and colic pains. The urine is moſt commonly of a deep red colour, and is voided frequently and in a ſmall quantity at a time. In more violent caſes the urine is commonly colourleſs.

Cauſes, &c. The remote cauſes of this diſeaſe may be various; as external contuſion, violent or long-continued riding; ſtrains of the muſcles of the back incumbent on the kidneys; various acrids in the courſe of circulation conveyed to the kidneys; and perhaps ſome other internal cauſes not yet well known: the moſt frequent is that of calculous matter obſtructing the *tubuli uriniferi*, or calculi formed in the pelvis of the kidneys, and either ſticking there or falling into the ureter.

Prognoſis. This is not different from that of other inflammatory diſeaſes.

Cure. When any of thoſe cauſes operating as inducing the inflammation ſtill continue to act, the firſt object in the cure muſt be the removal of theſe: but the principal intention to be had in view, is the reſolution of the inflammation which has already taken place. But when, notwithſtanding efforts for this purpoſe, the diſeaſe terminates in ſuppuration, it muſt be the endeavour of the practitioner to promote the diſcharge of purulent matter, and the healing of the ulceration in the kidney.

Theſe different objects are principally accompliſhed by bleeding, external fomentation, frequent emollient glyſters, antiphlogiſtic purgatives, and by the free uſe of mild and demulcent liquids. The uſe of bliſters is ſcarce admiſſible, or at leaſt will require great care to avoid any conſiderable abſorption of the cantharides.

The other ſpecies of nephritis enumerated by authors are only ſymptomatic.

Genus XX. CYSTITIS. 201

Inflammation of the Bladder.

Cyſtitis, *Sauv.* gen. 108. *Lin.* 31. *Vog.* 66. *Sag.* gen. 309.
Inflammatio veſicæ, *Hoffm.* II. 157.

The Cystitis from *Internal Cauſes.* 202

Cyſtitis ſpontanea, *Sauv.* ſp. 1.

The Cystitis from *External Cauſes.* 203

Cyſtitis a cantharidibus, *Sauv.* ſp. 2.
Cyſtitis traumatica, *Sauv.* ſp. 3.

The inflammation of the bladder from internal cauſes is a very rare diſtemper; and when it does at any time occur, is to be cured in the ſame manner with other inflammations, avoiding only the uſe of cantharides. When the diſeaſe ariſes from the internal uſe of theſe flies, camphor is recommended, beſides other cooling medicines, and particularly cooling and emollient glyſters.

204 Genus XXI. HYSTERITIS.

Inflammation of the UTERUS.

Hyſteritis, *Lin.* 38. *Vog.* 63.
Metritis, *Sauv.* gen. 107. *Sag.* gen. 315.
Inflammatio et febris uterina, *Hoffm.* II. 156.

Deſcription. This diſeaſe is often confounded with that called the *puerperal* or *child-bed fever;* but is eſſentially diſtinct from it, as will be ſhown in its proper place. The inflammation of the uterus is often apt to terminate by gangrene: there is a pain in the head, with delirium; and the uterine region is ſo exceedingly tender, that it cannot bear the moſt gentle preſſure without intolerable pain. When the *fundus uteri* is inflamed, there is great heat, throbbing, and pain, above the pubes; if its poſterior part, the pain is more confined to the loins and rectum, with a teneſmus; if its anterior part, it ſhoots from thence towards the neck of the bladder, and is attended with a frequent irritation to make water, which is voided with difficulty; and if its ſides or the ovaria are affected, the pains will then dart into the inſide of the thighs.

Cauſes, &c. Inflammation of the uterus, and indeed of the reſt of the abdominal viſcera, are very apt to take place in child-bed women; the reaſon of which ſeems to be the ſudden change produced in the habit, and an alteration in the courſe of the circulating blood by the contraction of the uterus after delivery. The preſſure of the gravid uterus being ſuddenly taken off from the *aorta deſcendens* after delivery, the reſiſtance to the impulſe of the blood paſſing through all the veſſels derived from it, and diſtributed to the contiguous viſcera, will be conſiderably leſſened: it will therefore ruſh into thoſe veſſels with a force ſuperior to their reſiſtance; and, by putting them violently on the ſtretch, may occaſion pain, inflammation, and fever. This contraction of the uterus alſo renders its veſſels impervious to the blood which had freely paſſed through them for the ſervice of the child during pregnancy; and conſequently a much larger quantity will be thrown upon the contiguous parts, which will ſtill add to their diſtenſion, and increaſe their tendency to inflammation.

Prognoſis. An inflammation of the uterus generally may be expected to produce an obſtruction of the lochia; but the fever produced ſeldom proves fatal, unleſs the inflammation be violent, and end in a gangrene.

Cure. This is to be attempted by the ſame general means already recommended, and the management of this diſorder entirely coincides with that of the puerperal fever.

205 Genus XXII. RHEUMATISMUS.

The RHEUMATISM.

Rheumatiſmus, *Sauv.* gen. 185. *Lin.* 62. *Vog.* 138. *Boerh.* 1400. *Junck.* 19.
Dolores rheumatici et arthritici, *Hoffm.* II. 317.
Myoſitis, *Sag.* gen. 301.

The *Acute* RHEUMATISM.

Rheumatiſmus acutus, *Sauv.* ſp. 1.
Rheumatiſmus vulgaris, *Sauv.* ſp. 2.

A. The LUMBAGO, or *Rheumatiſm in the muſcles of the Loins.* 206

Lumbago rheumatica, *Sauv.* gen. 212. *Sag.* p. 1.
Nephralgia rheumatica, *Sauv.* ſp. 4.

B. The SCIATICA, *Iſchias*, or *Hip-Gout.* 207

Iſchias rheumaticum, *Sauv.* 213. ſp. 10.

C. The *Baſtard* PLEURISY, or *Rheumatiſm in the muſcles of the Thorax.* 208

Pleurodyne rheumatica, *Sauv.* gen. 148. ſp. 3.
Pleuritis ſpuria, *Boerh.* 878.

The other ſpecies, which are very numerous, are all ſymptomatic; as,
Lumbago plethorica, *Sauv.* ſp. 3.
Iſchias ſanguineum, *Sauv.* ſp. 2.
Pleurodyne plethorica, *Sauv.* ſp. 1.
Rheumatiſmus hyſtericus, *Sauv.* ſp. 7.
Iſchias hyſtericum, *Sauv.* ſp. 3.
Pleurodyne hyſterica, *Sauv.* ſp. 6.
Rheumatiſmus ſaltatorius, *Sauv.* ſp. 8.
Pleurodyne flatulenta, *Sauv.* ſp. 4.
Pleurodyne a ſpaſmate, *Sauv.* ſp. 9.
Rheumatiſmus ſcorbuticus, *Sauv.* ſp. 4.
Lumbago ſcorbutica, *Sauv.* ſp. 5.
Pleurodyne ſcorbutica, *Sauv.* ſp. 11.
Iſchias ſyphiliticum, *Sauv.* ſp. 7.
Pleurodyne venerea, *Sauv.* ſp. 5.
Lumbago ſympathica, *Sauv.* ſp. 13.
a meſenterii glandulis induratis
a pancreate tumido, purulento, ſcirrhoſo, putri,
ab induratis pyloro, vena cava, pancreate
a rene ſcirrhoſo, putrefacto
ab abſceſſu circa venæ cavæ bifurcationem
a vermibus intra renes.
Lumbago a ſaburra, *Sauv.* ſp. 8.
Pleurodyne a cacochylia, *Sauv.* ſp. 7.
Rheumatiſmus ſalatorius verminoſus, *Sauv.* ſp. 8.
Iſchias verminoſum, *Sauv.* ſp. 8.
Pleurodyne verminoſa, *Sauv.* ſp. 2.
Rheumatiſmus metallicus, *Sauv.* ſp. 10.
Lumbago a hydrothorace, *Sauv.* ſp. 14.
Lumbago pſeudoiſchuria, *Sauv.* ſp. 16.
Pleurodyne a rupto œſophago, *Sauv.* ſp. 20.
Pleurodyne rachitica, *Sauv.* ſp. 13.
Iſchias a ſparganoſi, *Sauv.* ſp. 5.
Pleurodyne catarrhalis, *Sauv.* ſp. 14.
Rheumatiſmus necroſeos, *Sauv.* ſp. 14.
Rheumatiſmus dorſalis, *Sauv.* ſp. 11.
Lumbago a ſatyriaſi, *Sauv.* ſp. 15.
Rheumatiſmus febricoſus, *Sauv.* ſp. 9.
Lumbago febrilis, *Sauv.* ſp. 4.
&c. &c.

Deſcription. The rheumatiſm is particularly diſtinguiſhed by pains affecting the joints, and for the moſt part the joints alone; but ſometimes alſo the muſcular parts. Very often they ſhoot along the courſe of the muſcles from one joint to another, and are always much increaſed by the action of the muſcles belonging to the joint or of joints affected. The larger joints are thoſe moſt frequently affected, ſuch as the hip-joint and knees of the lower extremities, and the ſhoulders and elbows of the upper ones. The ancles and wriſts are alſo frequently affected; but the ſmaller joints, ſuch as thoſe of the toes or fingers, ſeldom ſuffer. Sometimes the diſeaſe is confined to one part of the body, yet very frequently it affects many parts of it; and then it begins with a cold ſtage, which is immediately ſucceeded by the other ſymptoms of pyrexia, and particularly by a frequent, full, and hard pulſe. Sometimes the pyrexia is formed before any pains are perceived; but more commonly pains are felt in particular parts before any ſymptoms of pyrexia occur. When no pyrexia is preſent, the pain may be confined to one joint only; but when any conſiderable pyrexia takes place, though the pain may chiefly be felt in one joint, yet it ſeldom happens that the pains do not affect ſeveral joints, often at the very ſame time, but for the moſt part ſhifting their place, and having abated in one joint they become more violent in another. They do not commonly remain long in the ſame joint, but frequently ſhift from one to another, and ſometimes return to joints formerly affected; and in this manner the diſeaſe often continues for a long time. The fever attending theſe pains has an exacerbation every evening, and is moſt conſiderable during the night, when the pains alſo become more violent; and it is at the ſame time that the pains ſhift their place from one joint to another. Theſe ſeem to be alſo increaſed during the night by the body being covered more cloſely, and kept warmer.

A joint, after having been for ſome time affected with pain, commonly becomes alſo affected with ſome ſwelling and redneſs, which is painful to the touch. It ſeldom happens that a ſwelling coming on does not take off the pain entirely, or ſecure the joint againſt a return of it. This diſeaſe is commonly attended with more or leſs ſweating, which occurs early, but is ſeldom free or copious, and ſeldom either relieves from the pains or proves critical. The urine is high coloured, and in the beginning without ſediment. This, however, does not prove entirely critical, for the diſeaſe often continues long after ſuch a ſediment has appeared in the urine. The blood is always ſizy. The acute rheumatiſm differs from all other inflammatory diſeaſes, in not being liable to terminate in ſuppuration: this almoſt never happens; but the diſeaſe ſometimes produces effuſions of a tranſparent gelatinous fluid into the ſheathes of the tendons: but if theſe effuſions be frequent, it is certain that the liquor muſt very frequently be abſorbed; for it very ſeldom happens, that conſiderable or permanent tumors have been produced, or ſuch as required to be opened and to have the contained fluid evacuated. Such tumors, however, have ſometimes occurred, and the opening made in them has produced ulcers very difficult to heal.

Sometimes the rheumatiſm will continue for ſeveral weeks; but it ſeldom proves fatal, and it is rare that the pyrexia continues to be conſiderable for more than two or three weeks. While the pyrexia abates in its violence, if the pains of the joints continue, they are leſs violent; more limited in their place, being confined commonly to one or a few joints only; and are leſs ready to change their place.

It is often a very difficult matter to diſtinguiſh rheumatiſm from gout; but in rheumatiſm there in general occurs much leſs affection of the ſtomach; it affects chiefly the larger joints, and ſeveral of theſe are often affected with ſevere pain at the ſame time: it occurs at an earlier period of life than gout; it is not obſerved to be hereditary; and it can in general be traced to ſome obvious exciting cauſe, particularly to the action of cold.

Cauſes, &c. This diſeaſe is frequent in cold, and more uncommon in warm, climates. It appears moſt frequently in autumn and ſpring; leſs frequently in winter, while the froſt is conſtant; and very ſeldom during the heat of ſummer. It may, however, occur at any ſeaſon, if viciſſitudes of heat and cold be for the time frequent. For the moſt part, the acute rheumatiſm ariſes from the application of cold to the body when unuſually warm; or when the cold is applied to one part of the body, whilſt the other parts are kept warm; or laſtly, when the application of the cold is long continued, as when moiſt or wet clothes are applied to any part of the body.—Theſe cauſes may affect perſons of all ages; but the reheumatiſm ſeldom appears either in very young or in elderly perſons, and moſt commonly occurs from the age of puberty to that of 35. Theſe cauſes may alſo affect perſons of any conſtitution, but they moſt commonly affect thoſe of a ſanguine temperament.

With reſpect to the proximate cauſe of rheumatiſm, there have been various opinions. It has been imputed to a peculiar acrimony; of which, however, there is no evidence; and the conſideration of the remote cauſes, the ſymptoms, and cure, render it very improbable. A diſeaſe of a rheumatic nature, however, may be occaſioned by an acrid matter applied to the nerves, as is evident from the tooth ach, a rheumatic affection generally ariſing from a carious tooth. Pains ariſing from deep-ſeated ſuppurations may alſo reſemble the rheumatiſm; and many caſes have occurred in which ſuch ſuppurations occaſioned pains reſembling the lumbago and iſchias; but from what hath been already ſaid, it ſeems improbable that ever any rheumatic caſe ſhould end in ſuppuration.

The proximate cauſe of rheumatiſm hath by many been ſuppoſed to be a lentor in the fluids obſtructing the veſſels of the part; but in the former part of this treatiſe, ſufficient reaſons have been already laid down for rejecting the doctrine of lentor. While we cannot therefore find either evidence or reaſon for ſuppoſing that the rheumatiſm depends on any change in the ſtate of the fluids, we muſt conclude that the proximate cauſe of it is the ſame with that of other inflammations not depending upon a direct ſtimulus.

In the caſe of rheumatiſm, it is ſuppoſed that the moſt common remote cauſe of it, that is, cold applied, operates eſpecially on the veſſels of the joints, theſe being leſs covered by a cellular texture than thoſe of the intermediate parts of the limbs. It is farther ſuppoſed, that the application of cold produces a conſtriction of the extreme veſſels, and at the ſame time an increaſe of tone or phlogiſtic diatheſis in the courſe of them, from which ariſes an increaſed impetus of

Phlegmaſiæ

the blood, and at the ſame time a reſiſtance to the free paſſage of it, and conſequently inflammations and pain. It is alſo ſuppoſed, that the reſiſtance formed, excites the *vis medicatrix* to a further increaſe of the impetus of the blood; and to ſupport this, a cold ſtage ariſes, a ſpaſm is formed, and a pyrexia and phlogiſtic diatheſis are produced in the whole ſyſtem.

Hence the cauſe of rheumatiſm appears to be exactly analogous to that of inflammations depending on an increaſed afflux of blood to a part while it is expoſed to the action of cold. But there ſeems to be further in this diſeaſe ſome peculiar affection of the muſcular fibres. Theſe ſeem to be under ſome degree of rigidity; and therefore leſs eaſily admit of motion, and are pained upon the exertions of it. This alſo ſeems to be the affection which gives opportunity to the propagation of pains from one joint to another, and which are moſt ſeverely felt in the extremities terminating in the joints, becauſe beyond theſe the oſcillations are not propagated. This affection of the muſcular fibres explains the manner in which ſtrains and ſpaſms produce rheumatic affections; and, on the whole, ſhows, that with an inflammatory affection of the ſanguiferous ſyſtem, there is alſo in rheumatiſm a peculiar affection of the muſcular fibres, which has a conſiderable ſhare in producing the phenomena of the diſeaſe. And it would even appear, that in what has commonly been called *acute rheumatiſm*, in contradiſtinction to the chronic, of which we are next to treat, there exiſts not only a ſtate of active inflammation in the affected parts, but alſo of peculiar irritability; and that this often remains after the inflammation is very much diminiſhed or has even entirely ceaſed. Hence a renewal of the inflammation and recurrence of the pain take place from very ſlight cauſes: and in the treatment of the diſeaſe both the ſtate of inflammation and irritability muſt be had in view.

Cure. for counteracting the ſtate of active inflammation, the chief aim of the practitioner muſt be to diminiſh the general impetus of the circulation, and the impetus at the part ~~particularly~~ affected. For counteracting the ſtate of irritability, he muſt endeavour to remove the diſpoſition to encreaſed action in the veſſels; to prevent the action of cauſes exciting painful ſenſations; and to obviate their influence on the part. The cure therefore requires, in the firſt place, an antiphlogiſtic regimen, and particularly a total abſtinence from animal-food, and from all fermented or ſpirituous liquors; ſubſtituting a mild vegetable or milk diet, and the plentiful uſe of ſoft diluting liquors. On this principle alſo, blood-letting is the chief remedy of acute rheumatiſm. The blood is to be drawn in large quantity; and the bleeding is to be repeated in proportion to the frequency, fulneſs, and hardneſs of the pulſe, and the violence of the pain. For the moſt part, large and repeated bleedings during the firſt days of the diſeaſe ſeem to be neceſſary, and accordingly have been very much employed: but to this ſome bounds are to be ſet; for very profuſe bleedings occaſion a ſlow recovery, and if not abſolutely effectual, are ready to produce a chronic rheumatiſm.

To avoid that debility of the ſyſtem which general bleedings are apt to occaſion, the urgent ſymptom of pain may be often relieved by topical bleedings; and when any ſwelling or redneſs have come upon a joint, the pain may very certainly be relieved by topical bleedings: but as the pain and continuance of the diſeaſe ſeem to depend more upon the phlogiſtic diatheſis of the whole ſyſtem than upon the affection of particular parts, ſo topical bleedings will not ſupply the place of the general bleedings propoſed above.

Rheumatiſmus.

To take off the phlogiſtic diatheſis prevailing in this diſeaſe, purging may be uſeful, if produced by medicines which do not ſtimulate the whole ſyſtem, as neutral ſalts, and other medicines which have a refrigerant power. Purging, however, is not ſo uſeful as bleeding in removing the phlogiſtic diatheſis; and when the diſeaſe has become general and violent, frequent ſtools are inconvenient, and even hurtful, by the motion and pain which they occaſion.

Next to blood-letting, nothing is of ſo much ſervice, both in alleviating the pains in this diſeaſe and in removing the phlogiſtic diatheſis, as the uſe of ſudorifics: and of all the medicines belonging to this claſs, what has commonly been known by the name of Dover's powder, a combination of powder, of ipecacuan and opium, is the moſt convenient and the moſt effectual. Copious ſweating, excited by this medicine, and ſupported for 10 or 12 hours by tepid diluents, ſuch as decoction of the woods, or the like, will in moſt inſtances produce a complete remiſſion of the pain: and by this practice, combined with blood-letting and proper regimen, the diſeaſe may often be entirely removed.

If, however, after complete intermiſſions from pain for ſome length of time have been obtained by theſe means, it be found that there is a great tendency to a return of the pains without any obvious cauſe, recourſe may be had with very great benefit to the uſe of the Peruvian bark. By the early uſe of this, where a complete intermiſſion from pain is obtained, the neceſſity of repeated blood-letting and ſweating is often ſuperſeded; but where a complete remiſſion cannot be obtained, it has been ſuſpected by ſome to be hurtful: and in theſe caſes, when blood-letting and ſudorifics have been puſhed as far as may be thought prudent without being productive of the deſired effect, very great benefit is often obtained from the uſe of calomel combined with opium, as recommended in the Edinburgh Medical Commentaries by Dr Hamilton of Lynn-regis

In this diſeaſe, external applications are of little ſervice. Fomentations in the beginning of the diſeaſe, rather aggravate than relieve the pains. The rubefacients and camphire are more effectual: but they, commonly only ſhift them from one part to another, and do not prove any cure of the general affection. Bliſtering may alſo be very effectual in removing the pain from a particular part; but will be of little uſe, except where the pains are much confined to one place.

ARTHRODYNIA, *or Chronic* RHEUMATISM. 209

Rheumatiſmus chronicus Auctorum.

Deſcription. When the pyrexia attending the acute rheumatiſm has ceaſed; when the ſwelling and redneſs of the joints are entirely gone, but pains ſtill continue to affect certain joints, which remain ſtiff, feel uneaſy upon motion, changes of weather, or in the night-time only, the diſeaſe is then called the *chronic rheumatiſm*, as it often continues for a very long time.

The limits between the acute and chronic rheumatiſms are not always exactly marked. When the pains are ſtill ready to ſhift their place; when they are eſpecially ſevere in the night-time; when, at the ſame time, they are attended with ſome degree of pyrexia, and with ſome ſwelling, and eſpecially ſome redneſs of the joints; the diſeaſe is to be conſidered as partaking of the nature of the acute rheumatiſm. But when there is no longer any degree of pyrexia remaining; when the pained joints are without redneſs; when they are cold and ſtiff; when they cannot eaſily be made to ſweat; or when, while a free and warm ſweat is brought out on the reſt of the body, it is only clammy and cold on the pained joints; and when, further, the pains of theſe are increaſed by cold, and relieved by heat, applied to them; the caſe is to be conſidered as that of a purely chronic rheumatiſm: or perhaps more properly the firſt of the conditions now deſcribed may be termed the ſtate of irritability, and the ſecond ſtate of atony.

The chronic rheumatiſm, or rather the atonic, may affect different joints; but is eſpecially apt to affect thoſe which are ſurrounded with many muſcles, and thoſe of which the muſcles are employed in the moſt conſtant and vigorous exertions. Such is the caſe of the vertebræ of the loins, the affection of which is named *lumbago;* or of the hip-joint, when the diſeaſe is named *iſchias* or *ſciatica.*

Violent ſtrains and ſpaſms occurring on ſudden and ſomewhat violent exertions, bring on rheumatic affections, which at firſt partake of the acute, but very ſoon change into the nature of the chronic, rheumatiſm.—Such are frequently the lumbago, and other affections, which ſeem to be more ſeated in the muſcles than in the joints. The diſtinction of the rheumatic pains from thoſe reſembling them which occur in the ſiphylis and ſcurvy muſt be obvious, either from the ſeat of the pains, or from the concomitant ſymptoms peculiar to thoſe diſeaſes. The diſtinction of the rheumatiſm from the gout will be more fully underſtood from what is laid down under the genus Podagra.

Cauſes, &c. The phenomena of the purely chronic rheumatiſm lead us to conclude, that its proximate cauſe is an atony both of the blood-veſſels and of the muſcular fibres of the part affected, together with ſuch a degree of rigidity and contraction in the latter as frequently attend them in a ſtate of atony: and indeed this atony, carried to a certain extent, gives riſe to a ſtate of paralyſis, with an almoſt total loſs of motion in the affected limbs. The paralytic ſtate of rheumatiſm therefore may be pointed out as a fourth condition of the diſeaſe, often claiming the attention of the practitioner.

Cure. From the view juſt now given of the proximate cauſe of chronic rheumatiſm, the chief indication of cure muſt be, to reſtore the activity and vigour of the part, which is principally to be done by increaſing the tone of the moving fibres, but which may ſometimes alſo be aided by giving condenſation to the ſimple ſolid. When, however, the diſeaſe has degenerated into the ſtate of paralyſis, the objects to be aimed at are, the reſtoration of a due condition to the nervous energy in the part affected; the obtaining free circulation of blood through the veſſels of the part; and the removal of rigidity in membranes and ligaments.

For anſwering theſe purpoſes, a great variety of remedies, both external and internal, are had recourſe to. The chief of the external are, the ſupporting the heat of the part, by keeping it conſtantly covered with flannel; the increaſing the heat of the part by external heat, applied either in a dry or humid form; the diligent uſe of the fleſh-bruſh, or other means of friction; the application of electricity in ſparks or ſhocks; the application of cold water by affuſion or immerſion; the application of eſſential oils of the moſt warm and penetrating kind; the application of ſalt brine; the employment of the warm bath or of the vapour baths, either to the body in general or to particular parts; and laſtly, the employment either of exerciſe of the part itſelf as far as it can eaſily bear, or by riding or other modes of geſtation.

The internal remedies are, Large doſes of eſſential oils drawn from reſinous ſubſtances, ſuch as turpentine. Subſtances containing ſuch oils, as guaiac. Volatile alkaline ſalts. Theſe or other medicines are directed to procure ſweat; and calomel, or ſome other preparation of mercury, in ſmall doſes, may be continued for ſome time. Beſides theſe, there are ſeveral others recommended. The cicuta, aconitum, and hyoſciamus, have in particular been highly extolled; and an infuſion of the rhododendron chryſanthum is ſaid to be employed by the Siberians with very great ſucceſs. An account of the Siberian mode of practice is given by Dr Matthew Guthrie of Peterſburgh, in the fifth volume of the Edinburgh Medical Commentaries, and has been followed with ſucceſs at other places.

G. XXIV. ODONTALGIA, the TOOTH-ACH. 210

Odontalgia, *Sauv.* gen. 198. *Lin.* 45. *Vog.* 145. *Sag.* gen. 157. *Junck.* 25.
Odontalgia ſive rheumatiſmus odontalgicus, *Hoffm.* II. 330.
Odontalgia carioſa, *Sauv.* ſp. 1.
Odontalgia ſcorbutica *Sauv.* ſp. 4.
Odontalgia catarrhalis, *Sauv.* ſp. 3.
Odontalgia arthritica, *Sauv.* ſp. 6.
Odontalgia gravidarum, *Sauv.* ſp. 2.
Odontalgia hyſterica, *Sauv.* ſp. 3.
Odontalgia ſtomachica, *Sauv.* ſp. 9.

Deſcription. This well-known diſeaſe makes its attack by a moſt violent pain in the teeth, moſt frequently in the *molares*, more rarely in the *inciſorii*, reaching ſometimes up to the eyes, and ſometimes backward into the cavity of the ear. At the ſame time there is a manifeſt determination to the head, and a remarkable tenſion and inflation of the veſſels takes place, not only in the parts next to that where the pain is ſeated, but over the whole head.

Cauſes, &c. The tooth-ach is ſometimes merely a rheumatic affection, ariſing from cold, but more frequently from a carious tooth. It is alſo a ſymptom of pregnancy, and takes place in ſome nervous diſorders; it may attack perſons at any time of life, tho' it is moſt frequent in the young and plethoric.

Cure. Many empirical remedies have been propoſed for the cure of the tooth-ach, but none have in any degree anſwered the purpoſe. When the affection is purely rheumatic, bliſtering behind the ear will almoſt always remove it; but when it proceeds from a carious tooth, the pain is much more obſtinate. In this caſe it has been recommended to touch the pained part with a hot iron, or with oil of vitriol, in order to deſtroy the aching nerve; to hold ſtrong ſpirits in the mouth; to put a drop of oil of cloves into the hollow of the tooth, or a pill of equal parts of opium and camphire: but one of the moſt uſeful applications of this kind is ſtrong nitrous acid, diluted with three or four times its weight of ſpirit of wine, and introduced into the hollow of a tooth from which great pain ariſes, either by means of an hair pencil or a little cotton. The Peruvian bark has alſo been recommended, and perhaps with more juſtice, on account of its tonic and antiſeptic powers; but very often all theſe remedies will fail, and the only infallible cure is to draw the tooth. See SURGERY.

211 GENUS XXIV. PODAGRA, the GOUT.

Podagra, *Vog.* 175. *Boerh.* 1254.
Febris podagrica, *Vog.* 69.
Arthritis, *Sauv.* gen. 183. *Lin.* 60. *Vog.* 139. *Sag.* gen. 142.
Dolor podagricus et arthriticus verus, *Hoffm.* II. 339.
Dolores arthritici, *Hoffm.* II. 317.
Affectus ſpaſtico-arthritici, *Junck.* 46.

212 Sp. I. The *Regular* GOUT.

Arthritis podagra, *Sauv.* ſp. 1.
Arthritis rachialgica, *Sauv.* ſp. 11.
Arthritis æſtiva, *Sauv.* ſp. 4.

213 Sp. II. The *Atonic* GOUT.

Arthritis melancholica, *Sauv.* ſp. 6.
Arthritis hiemalis, *Sauv.* ſp. 2.
Arthritis chlorotica, *Sauv.* ſp. 5.
Arthritis aſthmatica, *Sauv.* ſp. 9.

214 Sp. III. The *Retrocedent* GOUT.

215 Sp. IV. The *Miſplaced* GOUT.

Deſcription. What we call a *paroxyſm of the gout* is principally conſtituted by an inflammatory affection of ſome of the joints. This ſometimes comes on ſuddenly, without any warning, but is generally preceded by ſeveral ſymptoms; ſuch as the ceaſing of a ſweating which the feet had been commonly affected with before; an unuſual coldneſs of the feet and legs; a frequent numbneſs, alternating with a ſenſe of prickling along the whole of the lower extremities; frequent cramps of the muſcles of the legs; and an unuſual turgeſcence of the veins.

While theſe ſymptoms take place in the lower extremities, the body is affected with ſome degree of torpor and languor, and the functions of the ſtomach in particular are more or leſs diſturbed. The appetite is diminiſhed; and flatulency, or other ſymptoms of indigeſtion, are felt. Theſe ſymptoms take place for ſeveral days, ſometimes for a week or two, before a paroxyſm comes on; but commonly, upon the day immediately preceding it, the appetite becomes keener than uſual.

The circumſtances of paroxyſms are chiefly the following. they come on moſt commonly in the ſpring, and ſooner or later according as the vernal heat ſucceeds ſooner or later to the winter's cold; and, perhaps, ſooner or later alſo, according as the body may happen to be more or leſs expoſed to viciſſitudes of heat and cold.

The attacks are ſometimes felt firſt in the evening, but more commonly about two or three o'clock in the morning. The paroxyſm begins with a pain affecting one foot, moſt commonly in the ball or firſt joint of the great toe, but ſometimes in other parts of the foot. With the attack of this pain, there is commonly more or leſs of a cold ſhivering; which, as the pain increaſes, gradually ceaſes; and is ſucceeded by a hot ſtage of pyrexia, which continues for the ſame time with the pain itſelf. From the firſt attack, the pain becomes, by degrees, more violent, and continues in this ſtate with great reſtleſſneſs of the whole body till next midnight, after which it gradually remits; and, after it has continued for 24 hours from the commencement of the firſt attack, it commonly ceaſes almoſt entirely; and, with the coming on of a gentle ſweat, allows the patient to fall aſleep. The patient. upon coming out of this ſleep in the morning, finds the pained part affected with ſome redneſs and ſwelling, which, after having continued for ſome days, gradually abate.

When a paroxyſm has thus come on, although the violent pain after 24 hours be conſiderably abated, the patient is not entirely relieved from it. For ſome days he has every evening a return of more conſiderable pain and pyrexia, and theſe continue with more or leſs violence till morning. After going on in this manner for ſeveral days, the diſeaſe ſometimes goes entirely off, not till after a long interval.

When the diſeaſe, after having thus remained for ſome time in a joint, ceaſes entirely, it generally leaves the perſon in very perfect health, enjoying greater eaſe and alacrity in the functions of both body and mind than he had for a long time before experienced.

At the beginning of the diſeaſe, the returns of it are ſometimes only once in three or four years: but as it advances, the intervals become ſhorter, and at length the attacks are annual; afterwards they come twice each year; and at length recur ſeveral times during the courſe of autumn, winter, and ſpring; and as, when the fits are frequent, the paroxyſms become alſo longer, ſo, in the advanced ſtate of the diſeaſe, the patient is hardly ever tolerably free from it, except perhaps for two or three months in ſummer.

The progreſs of the diſeaſe is alſo marked by the parts which it affects. At firſt, it commonly affects one foot only; afterwards every paroxyſm affects both feet, the one after the other; and as the diſeaſe proceeds, it not only affects both feet at once, but, after having ceaſed in the foot which was ſecondly attacked, returns again into the firſt, and perhaps a ſecond time alſo into the other. Its changes of places are not only from one foot to another, but from the feet into other joints, eſpecially thoſe of the upper and lower extremities; ſo that there is hardly a joint of the body which, on one occaſion or other, is not affected. It ſometimes affects two different joints at the very ſame time; but more commonly it is at any one time ſevere in a ſingle joint only, and paſſes in ſucceſſion from one joint to another; ſo that the patient's affliction is often protracted for a long time.

When the diſeaſe has often returned, and the paroxyſms have become very frequent, the pains are commonly leſs violent than they were at firſt; but the patient is more affected with ſickneſs, and the other ſymptoms of the atonic gout, which ſhall be hereafter mentioned.

After the firſt paroxyſm of the diſeaſe, the joints which have been affected are entirely reſtored to their former ſuppleneſs and ſtrength; but after the diſeaſe has recurred very often, the joints affected do neither ſo ſuddenly nor entirely recover their former ſtate, but continue weak and ſtiff; and theſe effects at length proceed to ſuch a degree, that the joints loſe their motion entirely.

In many perſons, but not in all, after the diſeaſe has frequently recurred, concretions of a chalky nature are formed upon the outſide of the joints, and for the moſt part immediately under the ſkin. The matter ſeems to be depoſited at firſt in a fluid form, afterwards becoming dry and firm. In their firm ſtate, theſe concretions are a hard earthy ſubſtance, very entirely ſoluble in acids. After they have been formed, they contribute, with other circumſtances, to deſtroy the motion of the joint.

In moſt perſons who have laboured under the gout for many years, a nephritic affection comes on, and diſcovers itſelf by all the ſymptoms which uſually attend calculous concretions in the kidneys, and which we ſhall have occaſion to deſcribe in another place. All that is neceſſary to be obſerved here is, that the nephritic affection alternates with paroxyſms of the gout, and that the two affections, the nephritic and the gouty, are hardly ever preſent at the ſame time. This alſo may be obſerved, that children of gouty or nephritic parents commonly inherit one or other of theſe diſeaſes; but whether the principal diſeaſe of the parent may have been either gout or nephritis alone, ſome of the children have the one and ſome the other. In ſome of them, the nephritic affection occurs alone, without any gout ſupervening; and this happens to be frequently the caſe with the female children of gouty parents.

In the whole of the hiſtory already given, we have deſcribed the moſt common form of the diſeaſe, and which therefore, however diverſified in the progreſs of it, may be ſtill called the regular ſtate of the gout.—Upon ſome occaſions, however, the diſeaſe aſſumes different appearances: but as we ſuppoſe the diſeaſe to depend always upon a certain diatheſis, or diſpoſition of the ſyſtem; ſo every appearance which we can perceive to depend upon that ſame diſpoſion, we ſtill conſider as a ſymptom and caſe of the gout. The principal circumſtance, in what we term the *regular gout*, is the inflammatory affection of the joints; and whatever ſymptoms we can perceive to be connected with, or to depend upon, the diſpoſition which produces that inflammatory affection, but without its taking place or being preſent at the ſame time, we name the *irregular gout*.

Of ſuch irregular gout there are three different ſtates, which may be named the *atonic*, the *retrocedent*, and the *miſplaced* gout.

The firſt is, when the gouty diatheſis prevails in the ſyſtem; but from certain cauſes, does not produce the inflammatory affection of the joints. In this caſe, the morbid ſymptoms which appear, are chiefly affections of the ſtomach, ſuch as loſs of appetite, indigeſtion, and its various attendants of ſickneſs, nauſea, vomiting, flatulency, acid eructations, and pains in the region of the ſtomach. Theſe ſymptoms are frequently accompanied with pains and cramps in ſeveral parts of the trunk and the upper extremities of the body, which are relieved by the diſcharge of wind from the ſtomach. Together with theſe affections of the ſtomach, there commonly occurs a coſtiveneſs; but ſometimes a looſeneſs, with colic pains. Theſe affections of the alimentary canal are often attended with all the ſymptoms of hypochondriaſis, ſuch as dejection of mind, a conſtant and anxious attention to the ſlighteſt feelings, an imaginary aggravation of theſe, and an apprehenſion of danger from them.

In the ſame atonic gout, the viſcera of the thorax alſo are ſometimes affected, and palpitations, faintings, and aſthma, occur.

In the head alſo occur headachs, giddineſs, apoplectic and paralytic affections.

When the ſeveral ſymptoms now mentioned occur in habits having the marks of a gouty diſpoſition, this may be ſuſpected to have laid the foundation of them; and eſpecially when either, in ſuch habits, a manifeſt tendency to the inflammatory affection has formerly appeared, or when the ſymptoms mentioned are intermixed with and are relieved by ſome degree of the inflamatory gout. In ſuch caſes there can be no doubt of conſidering the whole as a ſtate of the gout.

Another ſtate of the diſeaſe we name the *retrocedent* gout. This occurs when an inflammatory ſtate of the joints has, in the uſual manner, come on, but without ariſing to the ordinary degree of pain and inflammation; or at leaſt without theſe continuing for the uſual time, or without their receding gradually in the uſual manner; theſe affections of the joints ſuddenly and entirely ceaſe, while ſome internal part becomes affected. The internal part moſt commonly attacked is the ſtomach; which then is affected with anxiety, ſickneſs, vomiting, or violent pain: but ſometimes the internal part is the heart, which gives occaſion to a ſyncope; ſome times it is the lungs, which are affected with aſthma; and ſometimes it is the head, giving occaſion to apoplexy or palſy. In all theſe caſes there can be no doubt that the ſymptoms are all a part of the ſame diſeaſe, however different the affection may ſeem to be in the parts which it attacks.

The third ſtate of irregular gout, which we name the *miſplaced*, is when the gouty diatheſis, inſtead of producing the inflammatory affection of the joints, produces an inflammatory affection of ſome internal part, and which appears from the ſame ſymptoms that attend the inflammations of thoſe parts ariſing from other cauſes.

Whether the gouty diatheſis does ever produce ſuch inflammation of the internal parts without having firſt produced it in the joints, or whether the inflammation of the internal part be always a tranſlation from the joints previouſly affected, we dare not determine; but, even ſuppoſing the latter to be always the caſe, we think the difference of the affection of the internal part muſt ſtill diſtinguiſh the *miſplaced* from what we have named the *retrocedent gout*.

With regard to the miſplaced gout, Dr Cullen, whom we here follow, tells us, that he never met with any caſes of it in his practice, nor does he find any diſtinctly marked by practical writers, except that of a pneumonic inflammation.

There are two caſes of a tranſlated gout; the one of which is an affection of the neck of the bladder, producing pain, ſtrangury, and a *catarrhus veſicæ*: the other is an affection of the rectum, ſometimes indicated by pain alone in that part, and ſometimes by hæmorrhoidal ſymptoms. In gouty perſons ſuch affections have been known to alternate with inflammatory affections of the joints; but whether theſe belong to the retrocedent or to the miſplaced gout, our author pretends not to determine.

It is commonly ſuppoſed, that there are ſome caſes of rheumatiſm which are ſcarcely to be diſtinguiſhed from the gout: but theſe, Dr Cullen thinks, are but few; and that the two diſeaſes may be for the moſt part diſtinguiſhed with great certainty, by obſerving the prediſpoſition, the antecedent circumſtances, the parts affected, the recurrences of the diſeaſe, and its connection with the ſyſtem; which circumſtances, for the moſt part, appear very differently in the two diſeaſes.

Cauſes, &c. The gout is generally an heriditary diſeaſe: but ſome perſons, without any hereditary diſpoſition, ſeem to acquire it; and in ſome an hereditary diſpoſition may be counteracted from various cauſes. It attacks the male ſex eſpecially; but it ſometimes, tho' more rarely, attacks alſo the female. The females liable to it are thoſe of the more robuſt and full habits; and it very often happens to thoſe before the menſtrual evacuation hath ceaſed. Dr Cullen hath alſo found it occurring in ſeveral females whoſe menſtrual evacuations were more abundant than uſual.

The gout ſeldom attacks eunuchs; and when it does, ſeem to fall upon thoſe who happen to be of a robuſt habit, to lead an indolent life, and to live very full. It attacks eſpecially men of robuſt and large bodies, who have large heads, are of full and corpulent habits, and whoſe ſkins are covered with a thicker *rete mucoſum*, which gives a coarſer ſurface. To ſpeak in the ſtyle of the ancient phyſicians, the gout will ſeldom be found to attack thoſe of a ſanguine, or ſuch as are of a purely melancholic temperament; but very readily thoſe of a *cholerico-ſanguine* temperament. It is, however, very difficult to treat this matter with preciſion. The gout ſeldom attacks perſons employed in conſtant bodily labour, or thoſe who live much upon vegetable aliment. It does not commonly attack men till after the age of 35; and generally not till a ſtill later period. There are indeed inſtances of the gout appearing more early; but theſe are few in compariſon of the others. When the diſeaſe does appear early in life, it ſeems to be in thoſe who have the hereditary diſpoſition very ſtrong, and to whom the remote cauſes hereafter mentioned have been applied in a very conſiderable degree.

As the gout is an heriditary diſeaſe, and affects men particularly of a certin habit, its remote cauſes may be conſidered as prediſponent and occaſional. The prediſponent cauſe, as far as expreſſed by external appearances, has been already marked; and phyſicians have been very confident in aſſigning the occaſional cauſes: but in a diſeaſe depending ſo much upon a prediſpoſition, the aſſigning occaſional cauſes muſt be uncertain; as in the prediſpoſed the occaſional cauſes may not always appear, and in perſons not prediſpoſed they may appear without effect; and this uncertainty muſt particularly affect the caſe of the gout.

The occaſional cauſes of the diſeaſe ſeem to be of two kinds. Firſt, thoſe which induce a phlethoric ſtate of the body. Secondly, thoſe which in plethoric habits, induce a ſtate of debility. Of the firſt kind are a ſedentary, indolent manner of life, and a full diet of animal-food. Of the ſecond kind of occaſional cauſes which induce debility are exceſs in venery; intemperance in the uſe of intoxicating liquors; indigeſtion, produced either by the quantity or quality of the aliments; much application to ſtudy or buſineſs, night-watching, exceſſive evacuations; the ceaſing of uſual labour; a ſudden change from a very full to a very ſpare diet; the large uſe of acids and aceſcents; and laſtly, cold applied to the lower extremities. The former ſeem to act by increaſing the prediſpoſition; the latter are commonly the exciting cauſes, both of the firſt attacks, and of the repetitions of the diſeaſe.

With reſpect to the proximate cauſe of the gout, it has generally been thought that it depends on a certain morbific matter always preſent in the body; and that this matter, by certain cauſes, thrown upon the joints or other parts, produces the ſeveral phenomena of the diſeaſe.

This doctrine, however ancient and generally received, appears to Dr Cullen to be very doubtful. For,

Firſt, there is no direct evidence of any morbific matter being preſent in perſons diſpoſed to the gout. There are no experiments or obſervations which ſhow that the blood or other humours of gouty perſons are in any reſpect different from thoſe of others. Previous to attacks of the gout, there appear no marks of any morbid ſtate of the fluids; for the diſeaſe generally attacks thoſe perſons who have enjoyed the moſt perfect health, and appear to be in that ſtate when the diſeaſe comes on. At a certain period of the diſeaſe, a peculiar matter indeed appears in gouty perſons; but this, which does not appear in every inſtance, and which appears only after the diſeaſe has ſubſiſted for a long time, ſeems manifeſtly to be the effect, not the cauſe, of the diſeaſe. Further, though there be certain acrids which, taken into the body, ſeem to excite the gout, it is probable that theſe acrids operate otherwiſe in exciting the diſeaſe, than by affording the material cauſe of it. In general, therefore, Dr Cullen thinks there is no proof of any morbific matter being the cauſe of the gout.

Secondly, the ſuppoſitions concerning the particular nature of the matter producing the gout, have been ſo various, and ſo contradictory, as to allow us to conclude, that there is truly no proof of the exiſtence of any of them. With reſpect to many of theſe ſuppoſitions, they are ſo inconſiſtent with chemical philoſopy, and with the laws of the animal œconomy, that they muſt be entirely rejected.

Thirdly, the ſuppoſition of a morbific matter as the cauſe is not conſiſtent with the phenomena of the diſeaſe, particularly with its frequent and ſudden tranſlations from one part to another.

Fourthly, the ſuppoſition is further rendered improbable by this, that, if a morbific matter did exiſt, its operation ſhould be ſimilar in the ſeveral parts which it attacks; whereas it ſeems to be very different, being ſtimulant, and exciting inflammation, in the joints; but ſedative and deſtroying the tone in the ſtomach: which, upon the ſuppoſition of the ſame particular matter acting in both caſes, is not to be explained by any difference in the part affected.

Fifthly, Some facts alledged in proof of a morbific matter, are not ſufficiently confirmed; ſuch as thoſe which would prove the diſeaſe to be contagious. There is, however, no proper evidence of this, the facts given being not only few, but exceptionable, and the negative obſervations innumerable.

Sixthly, Some arguments brought in favour of a morbific matter are founded upon a miſtaken explanation. The diſeaſe has been ſuppoſed to depend upon a morbific matter, becauſe it is hereditary. But the inference is not juſt; for moſt hereditary diſeaſes do not depend upon any morbific matter, but upon a particular conformation of the ſtructure of the body tranſmitted from the parent to the offſpring; and this laſt appears to be particularly the caſe in the gout. It may be alſo obſerved, that hereditary diſeaſes depending upon a morbific matter, appear always much more early in life than the gout commonly does.

Seventhly, The ſuppoſition of a morbific matter being the cauſe of the gout, has been hitherto uſeleſs, as it has not ſuggeſted any ſucceſsful method of cure. Particular theories of gout have often corrupted the practice, and have frequently led from thoſe views which might have been uſeful, and from that practice which experience had approved. Further, though the ſuppoſition of a morbific matter has been generally received, it has been as generally neglected in practice. When the gout has affected the ſtomach, nobody thinks of correcting the matter ſuppoſed to be preſent there, but merely of reſtoring the tone of the moving fibres.

Eigthly, The ſuppoſition of a morbific matter is quite ſuperfluous: for it explains nothing without ſuppoſing that matter to produce a change in the ſtate of the moving powers; and a change in the ſtate of the moving powers, produced by other cauſes, explains every circumſtance without the ſuppoſition of a morbific matter; and it may be obſerved, that many of the cauſes exciting the gout, do not operate upon the ſtate of the fluids, but directly and ſolely upon that of the moving powers.

Laſtly, Dr Cullen contends that the ſuppoſition of a morbific matter is ſuperfluous; becauſe, without that, the diſeaſe can be explained, he thinks, in a manner more conſiſtent with its phenomena, with the laws of the animal œconomy, and with the method of cure which experience has approved. We now proceed to give this explanation; but, before entering upon it, we muſt premiſe ſome general obſervations which Dr Cullen ſtates.

The firſt obſervation is, That the gout is a diſeaſe of the whole ſyſtem, or depends upon a certain general conformation and ſtate of the body, which manifeſtly appears from the facts abovementionned. But the general ſtate of the ſyſtem depends chiefly upon the ſtate of its primary moving powers; and therefore the gout may be ſuppoſed to be an affection of theſe chiefly.

The ſecond obſervation is, That the gout is manifeſtly an affection of the nervous ſyſtem; in which the primary moving powers of the whole ſyſtem are lodged. The occaſional or exciting cauſes are almoſt all ſuch as act directly upon the nerves and nervous ſyſtem; and the greater part of the ſymptoms of the atonic or retrocedent gout are manifeſtly affections of the ſame ſyſtem. This leads us to ſeek for an explanation of the whole of the diſeaſe, in the laws of the nervous ſyſtem, and particularly in the changes which may happen in the balance of its ſeveral parts.

The third obſervation is, That the ſtomach, which has ſo univerſal a conſent with the reſt of the ſyſtem, is the internal part that is the moſt frequently, and often very conſiderably, affected by the gout. The paroxyſms of the diſeaſe are commonly preceded by an affection of the ſtomach; many of the exciting cauſes act firſt upon the ſtomach, and the ſymptoms of the atonic and retrocedent gout are moſt commonly and chiefly affections of the ſame organ. This obſervation leads us to remark, that there is a balance ſubſiſting between the ſtate of the internal and that of the external parts; and in particular that the ſtate of the ſtomach is connected with that of the external parts, ſo that the ſtate of tone in the one may be communicated to the other.

Theſe obſervations being premiſed, Dr Cullen offers the following pathology of the gout.

In ſome perſons there is a certain vigorous and plethoric ſtate of the ſyſtem, which at a certain period of life is liable to a loſs of tone in the extremities. This is in ſome meaſure communicated to the whole ſyſtem, but appears more eſpecially in the functions of the ſtomach. When this loſs of tone occurs while the energy of the brain ſtill retains its vigour, the *vis medicatrix naturæ* is excited to reſtore the tone of the parts; and accompliſhes it, by exciting an inflammatory affection in ſome part of the extremities. When this has ſubſiſted for ſome days, the tone of the extremities and of the whole ſyſtem is reſtored, and the patient returns to his ordinary ſtate of health.

This is the courſe of things in the ordinary form of the diſeaſe, which we name the *regular gout;* but there are circumſtances of the body, in which this courſe is interrupted or varied. Thus, when the atony has taken place, if the reaction do not ſucceed, the atony continues in the ſtomach, or perhaps in other internal parts; and produces that ſtate which Dr Cullen, for reaſons now obvious, named the *atonic gout*.

A ſecond caſe of variation in the courſe of the gout is, when to the atony the reaction and inflammation have to a certain degree ſucceeded, but from cauſes either internal or external the tone of the extremities and perhaps of the whole ſyſtem is weakened; ſo that the inflammatory ſtate, before it had either proceeded to the degree, or continued for the time, requiſite for reſtoring the tone of the ſyſtem, ſuddenly and entirely ceaſes: whence the ſtomach and other internal parts, relapſe into the ſtate of atony; and perhaps have that increaſed by the atony communicated from the extremities: all which appears in what has been termed the *retrocedent ſtate of the gout*.

A third caſe of variation from the ordinary courſe of the gout, is, when to the atony, uſually preceding, an inflammatory reaction fully ſucceeds, but has its uſual determination to the joints by ſome circumſtances prevented; and is therefore directed to ſome internal part, where it produces an inflammatory affection, and that ſtate of things which we have named the *miſplaced gout*.

Though this theory of Dr Cullen's be ſupported with much ingenuity, yet we may confidently venture to aſſert, that on this ſubject he has been leſs ſucceſsful in eſtabliſhing his own opinion, than in combating thoſe of others; and this theory, as well as others formerly propoſed, is liable to numerous and unſurmountable objections. According to the hypotheſis, a vigourous and phlethoric habit ſhould in every caſe exiſt prior to the appearance of gout; which is by no means conſiſtent with fact; nor is it true that a vigorous and phlethoric habit is liable at a certain age to a loſs of tone in the extremities; which is another neceſſary condition in the hypotheſis. Loſs of tone often occurs in the extremities without exerting any peculiar influence on the ſtomach; and why a loſs of tone in the ſtomach ſhould excite the *vis medicatrix naturæ*, to reſtore it by exciting an inflammatory affection in ſome part of the extremities, is very inconceivable. Were the hypotheſis true, every dyſpeptic patient ſhould infallibly be affected with gout; which, however, is by no means the caſe. In ſhort, every ſtep in the theory is liable to unſurmountable objections; and it by no means, any more than former hypotheſes, explains the phenomena of the diſeaſe, particularly what Dr Cullen has himſelf ſo accurately pointed out, the connection of gouty with calculous complaints.

A very ingenious work has lately been publiſhed by an anonymous author, entitled "a Treatiſe on Gravel and upon Gout;" in which the ſources of each are inveſtigated, and effectual means of preventing or removing theſe diſeaſes recommended. In this treatiſe an attempt is made to prove, that both diſeaſes depend upon a peculiar concreting acid, the acid of calculi, or the *lithic acid*, as it has been ſtyled by ſome. He ſuppoſes this acid, conſtantly preſent to a certain degree in the circulating fluids, to be precipitated by the introduction of other acids; and in this manner he explains the influence of acid wines and other liquors, as claret, cyder, &c. inducing gout; for he conſiders the circumſtance chiefly conſtituting the diſeaſe as being an inflammation in parts of which the functions have been interrupted by the redundant acid precipitated. Although this theory be ſupported with much ingenuity, yet it is alſo liable to many objections. The ſudden attack of the affection; its ſudden tranſition from one part of the body to another; the inſtant relief of one part when another comes to be affected; and the various anomalous forms which the diſeaſe puts on, having an exact reſemblance to different affections; are altogether irreconcileable to the idea of its depending on any fixed obſtruction at a particular part ariſing from concreting acid. Nor does the plan of prevention and cure which he propoſes, and which conſiſt chiefly in abſtinence from acid and in the deſtruction of acid, by any means correſpond in every particular to be beſt eſtabliſhed facts reſpecting the treatment of gout; to which we next proceed.

Cure. In entering upon this, we muſt obſerve, in the firſt place, that a cure has been commonly thought impoſſible; and we acknowledge it to be very probable, that the gout, as a diſeaſe of the whole habit, and very often depending upon original conformation, cannot be cured by medicines, the effects of which are always very tranſitory, and ſeldom extend to the producing any conſiderable change of the whole habit.

It would perhaps have been happy for gouty perſons if this opinion had been implicitly received by them; as it would have prevented their having been ſo often the dupes of ſelf-intereſted pretenders, who have either amuſed them with inert medicines, or have raſhly employed thoſe of the moſt pernicious tendency. Dr Cullen, who has treated of the cure of the diſeaſe with great judgment, as he has done the theory with much ingenuity, is much diſpoſed to believe the impoſſibility of a cure of the gout by medicines; and more certainly ſtill inclined to think, that, whatever may be the poſſible power of medicines, yet no medicine for curing the gout has hitherto been found. Although almoſt every age has preſented a new remedy, all hitherto offered have, very ſoon after, been either neglected as uſeleſs, or condemned as pernicious.

But, though unwilling to admit the power of medicines, yet he contends, that a great deal can be done towards the cure of the gout by a regimen: and he is firmly perſuaded, that any man who, early in life, will enter upon the conſtant practice of bodily labour and of abſtinence from animal-food, will be preſerved entirely from the diſeaſe.

Whether there be any other means of radically curing the gout, the Doctor is not ready to determine. There are hiſtories of caſes of the gout, in which it is ſaid, that by great emotions of mind, by wounds, and by other accidents, the ſymptoms have been ſuddenly relieved, and never again returned; but how far theſe accidental cures might be imitated by art, or would ſucceed in other caſes, is at leaſt extremely uncertain.

The practices proper and neceſſary in the treatment of the gout, are to be conſidered under two heads; *Firſt*, As they are to be employed in the intervals of paroxyſms; or, *ſecondly*, As during the time of theſe. In the intervals of paroxyſms, the indications are, to prevent altogether the return of paroxyſms; or at leaſt to render them leſs frequent, and more moderate. During the time of paroxyſms, the indications are, to moderate the violence and ſhorten the duration of them as much as can be done with ſafety.

It has been already obſerved, that the gout may be entirely prevented by conſtant bodily exerciſe, and by a low diet; and Dr Cullen is of opinion that this prevention may take place even in perſons who have a hereditary diſpoſition to the diſeaſe. Even when the diſpoſition has diſcovered itſelf by ſeveral paroxyſms of inflammatory gout, he is perſuaded that labour and abſtinence will abſolutely prevent any returns of it for the reſt of life. Theſe, therefore, are the means of anſwering the firſt indication to be purſued in the intervals of paroxyſms.

Exerciſe in perſons diſpoſed to the gout, in Dr Cullen's opinion, has effect by anſwering two purpoſes: One of theſe is the ſtrengthening of the tone of the extreme veſſels; and the other, the guarding againſt a plethoric ſtate. For the former, if exerciſe be employed early in life and before intemperance has weakened the body, a very moderate degree of it will anſwer the purpoſe; and, for the latter, if abſtinence be at the ſame time obſerved, little exerciſe will be neceſſary.

With reſpect to exerciſe, this in general is to be obſerved, that it ſhould never be violent; for, if violent it cannot be long continued, and muſt always endanger the bringing on an atony in proportion to the violence of the preceding exerciſe.

It is alſo to be obſerved, that the exerciſe of geſtation, though conſiderable and conſtant, will not, if it be entirely without bodily exerciſe, anſwer the purpoſe in preventing the gout. For this end, therefore, the excerciſe muſt be in ſome meaſure that of the body, and muſt be moderate, but at the ſame time conſtant and continued through life.

In every caſe and circumſtance of the gout in which the patient retains the uſe of his limbs, bodily exerciſe, in the intervals of paroxyſms, will be always uſeful; and in the beginning of the diſeaſe, when the diſpoſition to it is not yet ſtrong, exerciſe, may prevent a paroxyſm which otherwiſe might have come on. In more advanced ſtates of the diſeaſe, however, when there is ſome diſpoſition to a paroxyſm, much walking will bring it on, either as it weakens the tone of the lower extremities, or as it excites an inflammatory diſpoſition in them; and thus it ſeems to be that ſtrains or contuſions often bring on a paroxyſm of the gout.

Abſtinence, the other part of the proper regimen for preventing, the gout is of more difficult application. If an abſtinence from animal food be entered upon early in life, while the vigour of the ſyſtem is yet entire, Dr Cullen has no doubt of its being both ſafe and effectual; but if the motive for this diet ſhall not have occurred till the conſtitution has been broken by intemperance or by the decline of life, a low diet may then endanger the bringing on an atonic ſtate.

Further, if a low diet be entered upon only in the decline of life, and be at the ſame time a very great change from the former manner of living, the withdrawing of an accuſtomed ſtimulus of the ſyſtem may readily throw this into an atonic ſtate.

The ſafety of an abſtemions courſe may be greater or leſs according to the management of it. It is animal food which eſpecially diſpoſes to the plethoric and inflammatory ſtate, and that food is to be therefore eſpecially avoided; but, on the other hand, vegetable aliment of the loweſt quality is in danger of weakening the ſyſtem too much by not affording ſufficient nouriſhment, and more particularly of weakening the tone of the ſtomach by its aceſcency. It is therefore a diet of a middle nature that is to be choſen; and milk is preciſely of this kind, as containing both animal and vegetable matter.

As approaching to the nature of milk, and as being a vegetable matter containing the greateſt portion of nouriſhment, the farinaceous ſeeds are next to be choſen, and are the food moſt proper to be joined with milk.

With reſpect to drink, fermented liquors are uſeful only when they are joined with animal food, and then by their aceſcency; and their ſtimulus is only neceſſary from cuſtom. When, therefore, animal food is to be avoided, fermented liquors are unneceſſary; and by increaſing the acceſcency of vegetables, theſe liquors may be hurtful. The ſtimulus of fermented or ſpirituous liquors is not necſſary to the young and vigorous, and when much employed impairs the tone of the ſyſtem. Theſe liquors, therefore, are to be avoided, except ſo far as cuſtom and the declining ſtate of the ſyſtem may have rendered them neceſſary. For preventing or moderating the regular gout, water is the only proper drink.

With reſpect to an abſtemious courſe, it has been ſuppoſed, that an abſtinence from animal food and fermented liquors, or the living upon milk and farinacea alone for the ſpace of one year, might be ſufficient for a radical cure of the gout; and it is poſſible that, at a certain period of life, in certain circumſtances of the conſtitution, ſuch a meaſure might anſwer the purpoſe But this is very doubtful; and it is more probable, that the abſtinence muſt, in a great meaſure, be continued, and the milk-diet be perſiſted in, for the remainder of life. It is well known, that ſeveral perſons who had entered on an abſtemious courſe, and had been thereby delivered from the gout, have, however, upon returning to their former manner of full living, had the diſeaſe return upon them with as much violence as before, or in a more irregular and more dangerous form.

It has been alleged, that, for preventing the return of the gout, blood-letting or ſcarifications of the feet, frequently repeated, and at ſtated times, may be practiſed with advantage; but of this Dr Cullen tells us he has had no experience; and the benefit of the practice is not, as far as we know, confirmed by the obſervation of any other practitioner.

Exerciſe and abſtinence are the means of avoiding the plethoric ſtate which gives the diſpoſition to the gout; and are therefore the means propoſed for preventing the paroxyſms, or at leaſt for rendering them leſs frequent and more moderate. But many circumſtances prevent the ſteadineſs neceſſary in purſuing theſe meaſures; and therefore, in ſuch caſes, unleſs great care be taken to avoid the exciting cauſes, the diſeaſe may frequently return; and, in many caſes, the preventing of paroxyſms is chiefly to be obtained by avoiding thoſe exciting cauſes already enumerated.

A due attention in avoiding theſe different cauſes will certainly prevent fits of the gout; and the taking care that the exciting cauſes be never applied in a great degree, will certainly render fits more moderate when they do come on. But, upon the whole, it will appear, that a ſtrict attention to the general conduct of life, is in this matter neceſſary; and therefore, when the prediſpoſition has taken place, it will be extremely difficult to avoid the diſeaſe.

Dr Cullen is firmly perſuaded, that, by obviating the prediſpoſition, and by avoiding the exciting cauſes, the gout may be entirely prevented. but, as the meaſures neceſſary for this purpoſe will, in moſt caſes, be purſued with difficulty, and even with reluctance, men have been very deſirous to find a medicine which might anſwer the purpoſe without any reſtraint on their manner of living. To gratify this deſire, phyſicians have propoſed, and, to take advantage of it, empirics have feigned, many remedies. Of what nature ſeveral of theſe remedies have been, it is difficult to ſay; but of thoſe which are unknown, we conclude, from their having been only of temporary fame, and from their having ſoon fallen into neglect, that they have been either inert or pernicious, and therefore ſhall make no inquiry after them; and ſhall now remark only upon one or two known remedies for the gout which have been lately in vogue.

One of theſe is what has been named in England the *Portland powder*. This is not a new medicine, but is mentioned by Galen, and, with ſome little variation in its compoſition, has been mentioned by the writers of almoſt every age ſince that time. It appears to have been at times in faſhion, and to have again fallen into neglect; and Dr Cullen thinks that this laſt has been owing to its having been found to be, in many inſtances, pernicious. In every inſtance which he has known of his exhibition for the length of time preſcribed, the perſons who had taken it were indeed afterwards free from any inflamatory affection of the joints; but they were affected with many ſymptoms of the atonic gout; and all, ſoon after finiſhing their courſe of the medicine, have been attacked with apoplexy, aſthma, or dropſy, which proved fatal.

Another remedy which has had the appearance of preventing the gout, is an alkali in various forms; ſuch as the fixed alkali, both mild and cauſtic, lime-water, ſoap, and abſorbent earths; and of late the alkaline aerated water has been more faſhionable than any other. Since it became common to exhibit theſe medicines in nephritic and calculous caſes, it has often happened that they were given to thoſe who were at the ſame time ſubject to the gout; and it has been obſerved, that under the uſe of theſe medicines, gouty perſons have been longer free from the fits of their diſeaſe. That, however, the uſe of theſe medicines has entirely prevented the returns of gout, Dr Cullen does not know; becauſe he never puſhed the uſe of thoſe medicines for a long time, being apprehenſive that the long-continued uſe of them might-produce a hutful change in the ſtate of the fluids.

As the preventing the gout depends very much on ſupporting the tone of the ſtomach, and avoiding indigeſtion; ſo coſtiveneſs, by occaſioning this, is very hurtful to gouty perſons. It is therefore neceſſary for ſuch perſons to prevent or remove coſtiveneſs, and by a laxative medicine, when needful; but it is at the ſame time proper, that the medicine employed ſhould be ſuch as may keep the belly regular, without much purging. Aloetics, rhubarb, magneſia alba, oleum ricini, or flowers of ſulphur, may be employed, as the one or the other may happen to be beſt ſuited to particular perſons.

Theſe are the ſeveral meaſures to be purſued in the intervals of the paroxyſms; and we are next to mention the meaſures proper during the time of them.

As during the time of paroxyſms the body is in a feveriſh ſtate, no irritation ſhould then be added to it; every part, therefore, of the antiphlogiſtic regimen except the application of cold, ought to be ſtrictly obſerved.

Another exception to the general rule may occur when the tone of the ſtomach is weak, and when the patient has been before much accuſtomed to the uſe of ſtrong drink; for then it may be allowable, and even neceſſary, to give ſome animal-food and a little wine.

That no irritation is to be added to the ſyſtem during the paroxyſms of gout, except in the caſes mentioned, is agreed upon among phyſicians; but it is a more difficult matter to determine, whether, during the time of paroxyſms, any meaſures may be purſued to moderate the violence of reaction and of inflammation. Dr Sydenham has given it as his opinion, that the more violent the inflammation and pain, the paroxyſm will be the ſhorter, as well as the interval between the preſent and the next paroxyſm longer: and, if this opinion be admitted as juſt, it will forbid the uſe of any remedies which might moderate the inflammation; which is, to a certain degree, undoubtedly neceſſary for the health of the body. On the other hand, acute pain preſſes for relief; and although a certain degree of inflammation may ſeem abſolutely neceſſary, it is not certain but that a moderate degree of it may anſwer the purpoſe; and it is even probable, that in many caſes the violence of inflammation may weaken the tone of the parts, and thereby invite a return of paroxyſms. It ſeems to be in this way, that, as the diſeaſe advances, the paroxyſms become more frequent.

From theſe laſt conſiderations, it ſeems probable, that during the time of paroxyſms, ſome meaſures may be taken to moderate, the violence of the inflammation and pain, and particularly, that in firſt paroxyſms, and in the young and vigorous, blood-letting at the arm may be practiſed with advantage: but this practice cannot be repeated often with ſafety; becauſe blood-letting not only weakens the tone of the ſyſtem, but may alſo contribute to produce plethora. However, bleeding by leeches on the foot, and upon the inflamed part, may be practiſed and repeated with greater ſafety: and inſtances have been known of its having been employed with ſafety to moderate and ſhorten paroxyſms; but how far it may be carried, we have not had experience enough to determine.

Beſides blood-letting and the antiphlogiſtic regimen, it has been propoſed to employ remedies for moderating the inflammatory ſpaſm of the part affected, ſuch as warm bathing and emollient poultices. Theſe have ſometimes been employed with advantage and ſafety; but at other times, have been found to give occaſion to a retroceſſion of the gout.

Bliſtering is a very effectual means of relieving and diſcuſſing a paroxyſm of the gout; but has alſo frequently had the effect of rendering it retrocedent. The ſtinging with nettles is analogous to bliſtering; and probably would be attended with the ſame danger. The burning with moxa, or other ſubſtances, is a remedy of the ſame kind; but though not found hurtful, there is no ſufficient evidence of its proving a radical cure.

Camphire, and ſome aromatic oils, have the power of allaying the pain, and of removing the inflammation from the part affected: but theſe remedies commonly make the inflammation only ſhift from one part to another and therefore with the hazard of its falling upon a part where it may be more dangerous, and they have ſometimes rendered the gout retrocedent.

From theſe reflections it will appear, that ſome danger muſt attend every external application to the parts affected during a paroxyſm; and that therefore the common practice of committing the perſon to patience and flannel alone, is eſtabliſhed upon the beſt foundation. Opiates give the moſt certain relief from pain but, when given in the beginning of gouty paroxyſms, it has by ſome been thought that they occaſion theſe to return with greater violence. When, however, the paroxyſms ſhall have abated in their violence, but ſtill continue to return, ſo as to occaſion painful and reſtleſs nights, opiates may be given with ſafety and advantage; eſpecially in the caſe of perſons advanced in life, and who have been often affected with the diſeaſe. When, after paroxyſms have ceaſed, ſome ſwelling and ſtiffneſs ſtill remain in the joints, theſe ſymptoms are to be diſcuſſed by the diligent uſe of the fleſh-bruſh. Purging immediately after a paroxyſm will be always employed with the hazard of bringing it on again.

Thus far of the REGULAR gout. We now proceed to conſider the management of the diſeaſe when it has become IRREGULAR.

In the *atonic* gout, the cure is to be accompliſhed by carefully avoiding all debilitating cauſes; and by employing, at the ſame time, the means of ſtrengthening the ſyſtem in general, and the ſtomach in particular.

For ſtrengthening the ſyſtem in general, Dr Cullen recommends frequent exerciſe on horſeback, and moderate walking. Cold bathing alſo may anſwer the purpoſe, and may be ſafely employed, if it appear to be powerful in ſtimulating the ſyſtem, and be not applied when the extremities are threatened with any pain.

For ſupporting the tone of the ſyſtem in general, when threatened with atonic gout, ſome animal food ought to be employed, and the more aceſcent vegetables ought to be avoided. In the ſame caſe, ſome wine alſo may be neceſſary; but it ſhould be in moderate quantity, and of the leaſt aceſcent kinds: and if every kind of wine ſhall be found to increaſe the acidity of the ſtomach, ardent ſpirits and water muſt be employed.

For ſtrengthening the ſtomach, bitters and the Peruvian bark may be employed; but care muſt be taken that they be not conſtantly employed for any great length of time.

The moſt effectual medicine for ſtrengthening the ſtomach is iron, which may be employed under various preparations; but the beſt appears to be the ruſt in fine powder, which may be given in large doſes.

For ſupporting the tone of the ſtomach, aromatics may be employed; but ſhould be uſed with caution, as the frequent and copious uſe of them have an oppoſite effect; and they ſhould therefore be given only in compliance with former habits, or for palliating preſent ſymptoms.

When the ſtomach happens to be liable to indigeſtion, gentle vomits may be frequently given, and proper laxatives ſhould be always employed to obviate or to remove coſtiveneſs.

In the atonic gout, or in perſons liable to it, to guard againſt cold is eſpecially neceſſary; and the moſt certain means of doing this, is by repairing to a warm climate during the winter ſeaſon. In the more violent caſes, bliſtering the lower extremities may be uſeful; but that remedy ſhould be avoided when any pain threatens the extremities. In perſons liable to the atonic gout, iſſues may be eſtabliſhed in the extremities as in ſome meaſure a ſupplement to the diſeaſe.

A ſecond caſe of the irregular gout, is the *retrocedent*.

When this affects the ſtomach and inteſtines, relief is to be inſtantly attempted by the free uſe of ſtrong wines, joined with aromatics, and given warm; or, if theſe ſhall not prove powerful enough, ardent ſpirits muſt be employed, and are to be given in a large doſe. In moderate attacks, ardent ſpirits, impregnated with garlic or with aſafœtida, may be employed; or, even without the ardent ſpirits, a ſolution of aſafœtida, with the volatile alkali, may anſwer the purpoſe. Opiates are often an effectual remedy; and may be joined with aromatics, as in the electuarium opiatum or they may be uſefully joined with volatile alkali and camphire. Muſk has likewiſe proved uſeful in this diſeaſe.

When the affection of the ſtomach is accompanied with vomiting, this may be encouraged by taking draughts of warm wine, at firſt with water, and afterwards without it; having at length recourſe, if neceſſary, to ſome of the remedies abovementioned, and particularly the opiates.

In like manner, if the inteſtines be affected with diarrhœa, this is to be at firſt encouraged by taking plentifully of weak broth; and when this ſhall have been done ſufficiently, the tumult is to be quieted by opiates.

When the retrocedent gout ſhall affect the lungs, and produce aſthma, this is to be cured by opiates, by antiſpaſmodics, and perhaps by bliſtering on the back or breaſt.

When the gout, leaving the extremities, ſhall affect the head, and produce pain, vertigo, apoplexy, or palſy, our reſources are very precarious. The moſt probable means of relief is, bliſtering the head; and, if the gout ſhall have receded very entirely from the extremities, bliſters may be applied to theſe alſo. Together with theſe bliſterings, aromatics, and the volatile alkali, may be thrown into the ſtomach.

The third caſe of the irregular gout is the *miſplaced*; that is, when the inflammatory affection of the gout, inſtead of falling upon the extremities, falls upon ſome internal part. In this caſe, the diſeaſe is to be treated by blood-letting, and by ſuch other remedies as would be proper in an idiopathic inflammation of the ſame parts.

Whether the tranſlation ſo frequently made from the extremities to the kidneys, is to be conſidered as an inſtance of the miſplaced gout ſeems uncertain: but Dr Cullen is diſpoſed to think it ſomething different; and therefore is of opinion, that, in the *nephralgia calculoſa* produced upon this occaſion, the remedies of inflammation are to be employed no farther than they

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may be otherwiſe ſometimes neceſſary in that diſeaſe, ariſing from other cauſes than the gout.

To this diſſertation on the gout, taken from the works of our late learned profeſſor, we cannot help ſubjoining a very uncommon caſe puliſhed by Dr Samuel Pye in the London Medical Tranſactions, where the gout would ſeem to have been occaſioned by a morbific matter, and to have been cured by the evacuation of it.

"Mr Major Rook, ſurgeon and apothecary in Upper Shadwell, of about 45 years of age, a ſober, temperate man, of a good habit of body, accuſtomed to no diſeaſe but the gout; the returns of the fits whereof had never been more frequent than once in 12 or 14 months, about the month of June 1752 was ſeized with a very ſevere paroxyſm of the gout. As I had known ſome extraordinary effects proceeding from a vegetable diet in that diſtemper, particularly in one gentleman, who, by a total abſtinence from all manner of food except cow's milk, and that without bread, had cured himſelf of this diſeaſe; and who, at the time I mentioned the caſe to my friend, was in the 13th year of his milk-diet; I perſuaded Mr Rook to try what vegetables would do for him: he readily complied, and entered upon it immediately, with a reſolution, that, if it anſwered his expectation, he would renounce fiſh and fleſh for ever.

"But after the moſt religious abſtinence from animal food of every kind for eleven weeks, being viſited by a gentle attack in both feet, he returned immediately to his animal food. This paroxyſm continued but 48 hours; but in March 1753 was ſucceded by a very ſevere one in both feet.

"The pain in his feet, heels, and ankles, increaſed with great violence for about 10 or 12 days; till at length he was in the moſt extreme agonies; ſuch as he had never felt before, and ſuch as almoſt made him mad. In the height of this extremity the pains (it is his own expreſſion) from the feet, heels, and ankles, flew as quick as lightning directly to the calves of his legs; but remaining there not half a minute, and not in the leaſt abating of their extreme violence (though the feet, heels, and ankles, were left entirely free from pain), from the calves, after a ſhort ſtay of about half a minute, the pains aſcended with the ſame velocity as before to both the thighs, at the ſame time leaving the calves of the legs free from pain from the thighs, in leſs than the ſpace of one minute, and as quick as before, they arrived at the abdomen; and after giving the patient one moſt ſevere twitch in the bowels, they reached the ſtomach: here the pains and here the fit ended, upon the patient's vomiting up about a pint and a half of a green aqueous liquor, but ſo extremely corroſive, that he compared it to the ſtrongeſt mineral acid.

"This extraordinary criſis happened at about two in the morning: immediately after this diſcharge he fell aſleep, and ſlept till ſeven or eight, and waked perfectly eaſy in every part, no ſigns of the diſtemper remaining but the ſwelling and tenderneſs of his feet; both of which went off gradually, ſo that in two days he was able to walk about his buſineſs.

"The next fit ſeized him in February 1754, in the common way; but was leſs violent than the former, and continued for about ſix weeks; during which time he had three increaſed paroxyſms, or diſtinct ſmart fits, which held him about two hours each; in the laſt of which he had the ſame critical diſcharge, by vomiting of the ſame corroſive matter, preceded by the ſame uncommon ſymptoms as in the fit of 1753. But mending every hour, he was able the very next day to walk, and attend his patients, with more eaſe than after the firſt mentioned fit; for the ſwelling abated much ſooner, and in three days diſappeared.

Podagra.

"I have ſaid, that this laſt fit was attended with three diſtinct paroxyſms, the laſt of which ended as above: yet to ſhow the diſpoſition of nature, in this caſe, to throw off the offending humour in this her new way, it is remarkable, that in the two firſt of theſe increaſed paroxyſms of pain, the patient declared to me that he never had the leaſt eaſe till he had vomited; but as there was no tranſlation of the pain before theſe vomitings, there was none of that corroſive matter to be diſcharged; nothing but the common contents of the ſtomach was to be ſeen. Theſe vomitings, however, procured the patient ſome eaſe; but the fit of the gout went on till the third paroxyſm was over, which ended as has been related.

"As the criſis in this caſe is uncommon, I muſt take notice of a ſymptom or two, which were no leſs extraordinary, in both theſe fits of the gout.

"A moſt profuſe ſweat attended the patient every morning during the whole courſe of the fits; which was ſo very offenſive, and at the ſame time his breath ſo uncommonly ſtinking, that neither the patient himſelf, nor thoſe who waited on him, were ever ſenſible of the like.

"His linen was tinged as with ſaffron; and his urine very high coloured, of almoſt as deep a red as claret: but, upon the critical vomitings, every one of theſe ſymptoms diſappeared with the diſeaſe.

"On the 9th of December 1755, he was attacked again in one foot. The ſymptoms, however, were ſo very mild, that he took no notice of them to his family till the 12th; from that day the pain was aggravated, and the ſwelling greatly increaſed, by walking and riding in a coach. On the 17th it became extremely violent, particularly in the heel; when it inſtantaneouſly left the parts affected, and in the ſame manner and with equal velocity (as in the two former fits), it flew into the calves of his legs, thighs, and abdomen; and when it had reached the ſtomach, it cauſed him to vomit the ſame kind of corroſive acid as in the two former fits; and though the quantity was no more than a tea-ſpoonful, he became perfectly well in two days.

"The ſame ſymptoms of fetid urine, and offenſive ſweats, attended the patient in this ſhort paroxyſm as in thoſe of 1753 and 1754; the ſweat continued but two nights, and the urine fetid only 48 hours.

"As Mr Rook had experienced ſo great and happy effects from the former critical vomitings, he was greatly diſappointed upon finding the quantity evacuated ſo very ſmall; for which reaſon he immediately attempted to increaſe it, by drinking three pints of warm water (which was at hand), but in vain; for neither that, nor the uſe of his finger, could provoke to an evacuation, which was begun and finiſhed by nature: for though the quantity evacuated was ſo very ſmall, yet as it was equally corroſive, and produced the ſame

effect,

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effect, the diſcharge muſt be accounted as truly critical as the others were.

"During the firſt of theſe fits, in the year 1752, a hard tumor had appeared on the ſide of the metatarſus near the middle of the right foot, which continued till after the third critical vomiting; when it was reſolved, and totally diſappeared, upon the diſcharge of a viſcid matter like the white of an egg, with a few ſmall chalk-ſtones from the end of the middle toe of the ſame foot. This diſcharge happened about four or five days before the patient was ſeized with a regular fit in April 1755. But it is to be remarked, that this laſt fit continued three or four weeks, and went off in the common way, without any of the critical diſcharges of vomiting, urine or ſweat; but left on one hand three, and on the other two, fingers loaded with chalk-ſtones; with this peculiar ſymptom, that when the weather was cold thoſe fingers were affected with a moſt exquiſite pain, which was always removed by heat.

"But not long after this laſt mentioned fit, a large quantity of chalk-ſtones were extracted from the bottom of the left foot, near the ball of the great toe, and that from time to time for about three or four months. On the 19th of January 1756 (the wound occaſioned by the chalk-ſtones being ſtill open), he was ſeized with a fever, without any ſymptom of the gout: the fever went off on the third day, with the ſame kind of critical ſweat and urine as always accompanied the acid vomitings in the forementioned fits. On the fourth day from the attack of the fever, a fit of the gout came on, with the common ſymptoms, in both feet; which continued with violence for about a week, with frequent retching and vomiting, but wthout bringing up more than the common contents of the ſtomach. At this time an uncommon itching in the bottom of the foot and ball of the great toe from whence the chalk-ſtones had been extracted, tormented the patient for five or ſix hours; upon his gently rubbing the part, he was very ſenſible of a fluctuation of ſome matter, which ſoon appeared to flow at firſt in ſmall quantities from the open orifice in the ball of the toe: upon preſſing the part, about a tea-cup full of a liquid chalky matter was collected. The next morning the patient made a large opening with an impoſthume knife, which produced more than half a pint of a bloody ſerous matter, full of chalk-ſtones, which proved as truly critical as the vomitings of the corroſive acid did in the caſes abovementioned; for the orifice from whence the chalk-ſtones firſt iſſued, was very ſoon healed, and the gentleman continues in perfect health."

216 Genus XXV. ARTHROPUOSIS.

Lumbago pſoadica *Sauv.* ſp. 6. *Fordyce*, Practice of Phyſic, P. II. p. 70.
Lumbago apoſtematoſa, *Sauv.* ſp. 12.
Lumbago ab arthrocace, *Sauv.* ſp. 17.
Iſchias ex abſceſſu, *Sauv.* ſp. 6.
Morbus coxarius, *De Haen*, Rat. Med. Vol. I. c. xxxii.

This is a diſeaſe very much reſembling the rheumatiſm; but differing both from it and the gout, in that it occaſions ſuppurations, which they ſeldom or never do. It frequently, according to Sauvages, attacks the pſoas muſcle; and occaſions excruciating pains, and then collections of matter.

Arthropuoſis.

The only cure is, if ſuppuration cannot be prevented, to lay open the part where the matter is contained, which would otherwiſe be abſorbed, and occaſion a fatal hectic.

Order III. EXANTHEMATA. 217

Exanthemata, *Sag.* Claſs X.
Phlegmaſiæ exanthematicæ, *Sauv.* Claſs III. Ord. I.
Morbi exanthematici, *Lin.* Claſs I. Ord. II.
Febres exanthematicæ, *Vog.* Claſs I. Ord. 2.

Genus XXVI. ERYSIPELAS. 218

St Anthony's Fire.

Eryſipelas *Sauv.* gen. 97. *Lin.* 10. *Sag.* gen. 296.
Febris eryſipelacea, *Vog.* 68. *Hoffm.* II. 98.

Sp. I. Erysipelas with *Bliſters.* 219

Eryſipelas roſa, *Sauv.* ſp. 1. *Sennert de febr.* lib. ii. c. 15.
Febris eryſipelatoſa, *Sydenham*, ſect. vi. cap. v.
Eryſipelas typhodes *Sauv.* ſp. 2.
Eryſipelas peſtilens, *Sauv.* ſp. 5.
Eryſipelas contagioſum, *Sauv.* ſp. 9.

Deſcription. The eryſipelas of the face, where this affection very frequently appears, comes on with a cold ſhivering, and other ſymptoms of pyrexia. The hot ſtage of this is frequently attended with a confuſion of the head, and ſome degree of delirium; and almoſt always with drowſineſs, and perhaps coma. The pulſe is always frequent, and commonly full and hard.—When theſe ſymptoms have continued for one two, or at moſt three days, an *erythema* appears on ſome part of the face. This at firſt is of no great extent, but gradually ſpreads from the part it firſt occupied to the other parts of the face, till it has affected the whole; and frequently from the face it ſpreads over the hairy ſcalp, or deſcends on ſome part of the cheek. As the redneſs ſpreads, it commonly leaves, or at leaſt is abated in the parts it had before occupied. All the parts which the redneſs affects are alſo affected with ſome ſwelling, which continues for ſome time after the redneſs has abated. The whole face becomes conſiderably turgid; and the eye-lids are often ſo much ſwelled as entirely to ſhut up the eyes. When the redneſs and ſwelling have continued for ſome time, there commonly ariſe, ſooner or later, bliſters of a larger or ſmaller ſize on ſeveral parts of the face. Theſe contain a thin colourleſs liquor, which ſooner or later runs out. The ſurface of the ſkin in the bliſtered places, ſometimes becomes livid and blackiſh; but this ſeldom goes deeper, or diſcovers any degree of gangrene affecting the ſkin. On the parts of the face not affected with bliſters, the cuticle ſuffers, towards the end of the diſeaſe, a conſiderable deſquamation. Sometimes the tumor of the eye-lids ends in a ſuppuration.

The inflammation coming upon the face does not produce any remiſſion of the fever which had before prevailed; and ſometimes the fever increaſes with the ſpreading and increaſing inflammation. The inflammation

tion commonly continues for eight or ten days; and, for the ſame time, the fever and ſymptoms attending it alſo continues. In the progreſs of the diſeaſe the delirium and coma attending it ſometimes go on increaſing, and the patient dies apoplectic on the ſeventh, ninth, or eleventh day of the diſeaſe. In ſuch caſes it has been commonly ſuppoſed, that the diſeaſe is tranſlated from the external to the internal parts. But Dr Cullen thinks, that the affection of the brain is merely a communication from the external affection, as this continues increaſing at the ſame time with the internal. When the fatal event does not take place, the inflammation, after having affected the whole face, and perhaps the other external parts of the head, ceaſes, and with that the fever alſo; and, without any other criſis, the patient returns to his ordinary health. This diſeaſe is not commonly contagious; but as it may ariſe from an acrid matter externally applied, ſo it is poſſible that the diſeaſe may ſometimes be communicated from one perſon to another. Perſons who have once laboured under this diſeaſe are liable to returns of it.

Prognoſis. The event of this diſeaſe may be foreſeen from the ſtate of the ſymptoms which denote more or leſs the affection of the brain. If neither delirium nor coma come on, the diſeaſe is ſeldom attended with any danger; but when theſe ſymptoms appear early in the diſeaſe, and are in a conſiderable degree, the utmoſt danger is to be apprehended.

Cure. The eryſipelas of the face is to be cured, according to the opinion of moſt practitioners, much in the ſame manner as phlegmonic inflammations; by blood-letting, cooling purgatives, and by employing every part of the antiphlogiſtic regimen. Many obſervations, however, would lead us to conclude, that in not a few caſes the concomitant fever has here a tendency to the typhoid type; and therefore evacuations apparently ſerviceable in the firſt inſtance have afterwards a bad effect. The evacuations of blood-letting and purging are to be employed more or leſs according to the urgency of ſymptoms; particularly thoſe which mark an affection of the brain. As the pyrexia continues, and often increaſes with the inflammation of the face, ſo the evacuations abovementioned are to be employed at any time of the diſeaſe. When, however, the fever, in place of marks of the phlogiſtic diatheſis, particularly a full, hard, and ſtrong pulſe, is attended with ſymptoms of great debility, and with a ſmall pulſe eaſily compreſſible; evacuations, particularly under the form of blood-letting, muſt be uſed with very great caution. Even in ſuch caſes, however, the uſe of refrigerant cathartics may ſtill be perſiſted in with more ſafety and greater advantage. But whether evacuants have been employed or not, when ſymptoms of debility run to a great height, and marks of putreſcent tendency appear, recourſe muſt be had to wine and the Peruvian bark. In caſes which at the commencement require evacuation, theſe are often in the after periods employed with very great benefit.

In this, as in other diſeaſes of the head, when that part happens to be the ſeat of eryſipelas, it is proper to put the patient, as often as he can eaſily bear it, into ſomewhat of an erect poſture; and as in this diſeaſe there is always an external affection, ſo various external application have been propoſed to be made to the part affected; but almoſt all of them are of doubtful effect.

An eryſipelas frequently appears on other parts of the body beſides the face, and ſuch other eryſipelatous inflammations frequently end in ſuppuration; but theſe caſes are ſeldom dangerous. At coming on they are ſometimes attended with drowſineſs, and even with ſome delirium; but this ſeldom happens, and theſe ſymptoms do not continue after the inflammation is formed; and Dr Cullen does not remember to have ſeen an inſtance of the tranſlation of an inflammation from the limbs to an internal part; and though theſe inflammations of the limbs be attended with pyrexia, they ſeldom require the ſame evacuations as the eryſipelas of the face.

Sp. II. ERYSIPELAS with *Phlyctenæ*. 220

Eryſipelas zoſter, *Sauv.* ſp. 8.
Zona; Anglis, *The* SHINGLES, *Ruſſel* de tab. gland. p. 124. Hiſt. 35.
Herpes zoſter, *Sauv.* ſp. 9.

THIS differs from the former in no other way than in being attended with an eruption of phlyctenæ or ſmall watery bladders on ſeveral parts of the body.—The method of cure is the ſame.

GEN. XXVII. PESTIS, the PLAGUE. 221

Peſtis, *Sauv.* gen. 91. *Lin.* 2. *Junk.* 78.
Febris peſtilentialis, *Vog.* 33. *Hoffm.* II. 93.
Peſtis benigna, *Sauv.* ſp. 2. Peſtis Maſſilienſis, Claſs III. Traité de la peſte, p. 41. Ejuſdem peſtis, Cl. 5to Traité p. 228.
Peſtis remittens, *Sauv.* ſp. 9.
Peſtis vulgaris, *Sauv.* ſp. 1. Peſtis Maſſil. Cl. ii. Traité, p. 38. Ejuſd. Cl. iii. & iv. Traité, p. 225, &c. *Waldſchmidt.* de peſte Holſatica, apud *Halleri* Diſſ. Pract. tom. v. *Chenot.* de peſte Tranſylvanica, 1755, 1759, *De Haen*, Rat. Med. pars xiv.
Peſtis Egyptiaca, *Sauv.* ſp. 11. *Alpin.* de Med. Egypt.
Peſtis interna, *Sauv.* ſp. 3. Peſt. Maſſil. Cl. I. Traité, p. 37—224.

Hiſtory. OF this diſtemper Dr Cullen declines giving any particular hiſtory, becauſe he never ſaw it; from the accounts of other authors, however, he is of opinion, that the circumſtances peculiarly characteriſtic of it, eſpecially of its more violent and dangerous ſtates, are, 1. The great loſs of ſtrength in the animal function, which often appears early in the diſeaſe. 2. The ſtupor, giddineſs, and conſequent ſtaggering, which reſembles drunkenneſs, or the headach and various delirium all of them denoting a great diſorder in the functions of the brain. 3. Anxiety, palpitation, ſyncope, and eſpecially the weakneſs and irregularity of the pulſe, denoting a conſiderable diſturbance in the action of the heart. 4. Nauſea and vomiting, particularly the vomiting of bile, which ſhows an accumulation of vitiated bile in the gall-bladder and biliary ducts, and from thence derived into the inteſtines and ſtomach; and which denote a conſiderable ſpaſm, and loſs of tone in the extreme veſſels on the

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ſurface of the body. 5. The buboes and carbuncles, which denote an acrimony prevailing in the fluids and, laſtly, The petechiæ, hæmorrhages, and colliquative diarrhœa, which denote a putreſcent tendency prevailing in a great degree in the maſs of blood.

To theſe characteriſtics of the plague enumerated by Dr Cullen, we ſhall add one mentioned by Sir John Pringle, which though perhaps leſs frequent than the others, yet ſeems worthy of notice. It is this, That in the plague there is an extraordinary enlargement of the heart and liver. In nine diſſections of bodies dead of the plague at Marſeilles, this extraordinary enlargement of the heart is taken notice of in all of them, and of the liver in ſeven of them. The account was ſent to the Royal Society by M. Didier, one of the phyſicians to the king of France, and has been publiſhed in the Philoſophical Tranſactions. In the firſt caſe, the author takes notice, that "the heart was of an extraordinary bigneſs; and the liver was of double the natural ſize.—Caſe 2. the heart was of a prodigious bigneſs, and the liver much enlarged.—Caſe 3. The heart double the natural bigneſs.—Caſe 4. The heart was very large, and the liver was bigger and harder than ordinary.—Caſe 5. The heart was of a prodigious bigneſs.—Caſe 6. the heart was larger than in its natural ſtate; the liver alſo was very large.—Caſe 7. the heart was of a prodigious ſize, and the liver was very large.—Caſe 8. The heart was much larger than natural, and the liver of a prodigious ſize.—Caſe 9. The heart was double the natural bigneſs, and the liver was larger than ordinary."—This preternatural enlargement Dr Pringle thinks is owing to the relaxation of the ſolid parts, by which means they become unable to reſiſt the impetus of blood, and therefore are eaſily extended; as in the caſe of infancy, where the growth is remarkably quick. And a ſimilar enlargement he takes notice of in the ſcurvy, and other putrid diſeaſes.

A very elaborate work has lately been publiſhed on the ſubject of the plague by Dr Patrick Ruſſel, formerly phyſician to the Britiſh factory at Aleppo. In this work, a very full hiſtory is given of the various forms and varieties of the diſeaſe. He makes particular obſervations on the following ſymptoms, which, in addition to the peſtilential eruptions, he conſiders as the moſt important concomitants of plague, *viz.* fever, delirium, coma, inpediment or loſs of ſpeech, deafneſs, muddineſs of the eyes, white tongue, ſtate of the pulſe, reſpiration, anxiety, pain at the heart, inquietude, debility, fainting, convulſion, appearances of the urine, perſpiration, vomiting, looſeneſs, and hæmorrhagy; and he concludes theſe remarks with ſome obſervations on the occurrence of the plague with pregnant women. To point out more diſtinctly the ſtable varieties of the diſeaſe, he arranges the peſtilential caſes which fell under his obſervation at Aleppo under ſix claſſes: and he concludes his deſcription with a very minute and particular account of the peſtilential eruptions, appearing under the form either of buboes, carbuncles, or other exanthemata. The preſence of the two firſt, he obſerves either ſepartely or conjunctly, leaves the nature of the diſtemper unequivocal. But fatal has been the error of raſhly pronouncing a diſtemper not to be a plague from their abſence. Buboes affected the inguinal, axillary, parotid, maxillary, and cervical glands. But the firſt were the moſt commonly affected, and the two latter ſeldom obſerved to ſwell, without either the parotid ſwelling at the time or ſoon after. Of the carbuncles, Dr Ruſſel deſcribes five different varieties. The other exanthemata, which he obſerved ſometimes, though leſs frequently, attending the plague, were petechiæ, a marbled appearance of the ſkin, an eryſipelatous redneſs, ſtreaks of a reddiſh purple or livid colour, vibices or weals, and large blue or purple ſpots, the *maculæ magnæ* of authors. In ſome caſes, an extraordinary concurrence of eruptions took place, which was chiefly obſerved among children under 10 years of age.

Cauſes, &c. From a conſideration of the ſymptoms abovementioned, Dr Cullen concludes, that the plague is owing to a ſpecific contagion, often ſuddenly producing the moſt conſiderable debility in the nervous ſyſtem or moving powers, and a general putreſcency in the fluids. Dr Ruſſel alſo conſiders the diſeaſe as being univerſally the conſequence of what may be called *peſtilential contagion;* and has judiciouſly repelled the objections which have been brought againſt this doctrine.

Prevention. Here we muſt refer to all thoſe methods of preventing and removing the incipient contagion of putrid fevers, which have been ſo fully enumerated. Dr Cullen is perſuaded that the diſeaſe never ariſes in the northern parts of Europe, but in conſequence of being imported from ſome other country. The magiſtrate's firſt care therefore ought to be to prevent the importation; and this may generally be done by a due attention to bills of health, and to the proper performance of quarantines.—With reſpect to the latter, he is of opinion, that the quarantines of perſons may with ſafety be much leſs than 40 days; and if this were allowed, the execution of the quarantine would be more exact and certain, as the temptation to break it would be in a great meaſure avoided. With reſpect to the quarantine of goods, it cannot be perfect unleſs the ſuſpected goods be unpacked, duly ventilated, and other means be employed for correcting the infection they may carry; and if all this be properly done, it is probable that the time commonly preſcribed for quarantine may be alſo ſhortened.

A ſecond meaſure in the way of prevention is required, when an infection has reached and prevailed in any place, to prevent that infection from ſpreading into others. This can only be done by preventing the inhabitants or the goods of any infected place from going out of it till they have undergone a proper quarantine.

The third meaſure, and which ought to be employed with great care, is, to prevent the infection from ſpreading among the inhabitants of a place in which it has ariſen. And in this caſe, a great deal may be done by the magiſtrate, 1. By allowing as many of the inhabitants as are free from infection, and are not neceſſary to the ſervice of the place, to go out of it. 2. By diſcharging all aſſemblies, or unneceſſary intercourſe of the people. 3. By ordering ſome neceſſary communications to be performed without contact. 4. By making ſuch arrangements and proviſions

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viſions as may render it eaſy for the families remaining to ſhut themſelves up in their own houſes. 5. By allowing perſons to quit houſes where an infection appears, upon condition that they go into lazarettoes. 6. by ventilating and purifying, or deſtroying, at the public expence, all infected goods. 7. By avoiding hoſpitals, and providing ſeparate apartments for infected perſons.

The fourth and laſt part of the buſineſs of prevention reſpects the conduct of perſons neceſſarily remaining in infected places, eſpecially thoſe obliged to have ſome communication with perſons infected. Thoſe obliged to remain in places infected, but not to have any near communication with the ſick, muſt avoid all near communication with other perſons or their goods; and it is probable, that a ſmall diſtance will ſerve, if, at the ſame time, there be no ſtream of air to carry the effluvia of perſons or goods to ſome diſtance. Thoſe who are obliged to have a near communication with the ſick ought to avoid any of the debilitating cauſes which render the body ſuſceptible of infection, as a ſpare diet, intemperance in drinking, exceſs in venery, cold, fear, or other depreſſing paſſions of the minds. A full diet of animal food is alſo to be avoided, becauſe it increaſes the irritability of the body, and favours the operation of contagion; and indigeſtion, whether from the quantity or quality of the food, contributes very much to the ſame.

Beſides theſe, it is probable that the moderate uſe of wine and ſpirituous liquors, moderate exerciſe, and the cold bath, may be of uſe; tonic medicines alſo, of which the Peruvian bark is deſervedly accounted the chief, may likewiſe be uſed with ſome probability of ſucceſs. If any thing is to be expected from antiſeptics, Dr Cullen thinks camphor preferable to any other. In general, however, every one is to be indulged in the medicine of which he has the beſt opinion, provided it is not evidently hurtful. Whether iſſues be uſeful in preſerving from the effects of contagion, is a matter of doubt. Dr Ruſſel in his treatiſe enters very fully into the conſideration of the means of prevention, both with reſpect to quarantines, lazarettoes, and bills of health. He is of opinion, that the preſent laws on theſe ſubjects are in many reſpects defective: and he thinks, that a ſet of new regulations would have the beſt chance of a deliberate and impartial diſcuſſion in the ſenate, if the inquiry were taken at a time free from all apprehenſion of immediate danger.

Cure. Here according to Dr Cullen, the indications are the ſame as in fever in general, but are not all equally important. The meaſures for moderating the violence of reaction, which operate by diminiſhing the action of the heart and arteries, have ſeldom, he thinks, any place here, excepting that the antiphlogiſtic regimen is generally proper. Some phyſicians have recommended bleeding, and Sydenham even ſeems to think it an effectual cure; but Dr Cullen ſuppoſes, that for the moſt part it is unneceſſary, and in many caſes might do much hurt. Dr Ruſſel, however, who on this ſubject ſpeaks from experience and actual obſervation, is of a different opinion. With moſt of his patients, a ſingle bleeding was employed with advantage; and even where the ſick under his inſpection were bled oftener than once, he did not find that the [illegible] ſtage was thereby hurried on. Purging has alſo been recommended; and in ſome degree it may be uſeful in drawing off the putreſcent matter frequently preſent in the inteſtines; but a large evacuation this way may certainly be hurtful.

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The moderating the violence of reaction, as far as it can be done, by taking off the ſpaſm of the extreme veſſels, is a meaſure, in Dr Cullen's opinion, of the utmoſt neceſſity in the cure of the plague; and the whole of the means formerly mentioned, as ſuited to this indication, are extremely proper. The giving an emetic, at the firſt approach of the diſeaſe, would probably be of great ſervice; and it is probable that, at ſome other periods of the diſeaſe, emetics might be uſeful, both by evacuating bile abounding in the alimentary canal, and by taking off the ſpaſm of the extreme veſſels. Indeed Baron Aſh, and ſome other of the Ruſſian practitioners, repreſent the early and repeated uſe of emetics as the only effectual mode of cure.

From ſome principles with reſpect to fever in general, and with reſpect to the plague in particular, Dr Cullen is of opinion, that after the exhibition of the firſt vomit, the body ſhould be diſpoſed to ſweat; but this ſweat ſhold be raiſed only to a moderate degree, though it muſt be continued for 24 hours or more if the patient bears it eaſily. The ſweating is to be excited and conducted according to the rules laid down under SYNOCHA; and muſt be promoted by a plentiful uſe of diluents rendered more grateful by vegatable acids, or more powerful by being impregnated with ſome portion of neutral ſalts. To ſupport the patient under the continuance of the ſweat, a little weak broth, acidulated with the juice of lemons, may be given frequently, and ſometimes a little wine if the heat of the body be not conſiderable. If ſudorific medicines are judged neceſſary, opiates will be found moſt effectual and ſafe; but they ſhould not be combined with aromatics, and probably may be more effectual if joined with a portion of emetics and of neutral ſalts. But if, notwithſtanding the uſe of emetics and ſudorifics in the beginning, the diſeaſe ſhould ſtill continue, the cure muſt turn upon the uſe of means for obviating debility and putreſcency; and for this purpoſe tonic medicines, eſpecially the Peruvian bark, and cold drink, are the moſt proper. For the treatment of buboes and carbuncles, ſee the article SURGERY.

GENUS XXVIII. VARIOLA. 222

The SMALL-POX.

Variola, *Sauv.* gen. 92. *Lin.* 3. *Sag.* gen. 290.
Febris varioloſa, *Vog.* 35. *Hoffm.* II. 49.
Variolæ, *Boerh.* 1371. *Junck.* 76.

Sp. I. *The Diſtinct* SMALL-POX. 223

Variola diſcreta benigna, *Sauv.* ſp. 2.
Variolæ regulares diſcretæ, *Sydenh.* ſect. iii. cap. 2.
Variolæ diſcretæ ſimplices, *Helvet.* Ob. ſp. 1.
Variola diſcreta complicata, *Sauv.* ſp. 2. *Helvet.* ſp. 2.
Variolæ anomalæ, *Sydenh.* ſect. iv. cap 6.
Variola diſcreta dyſenteriodes, *Sauv.* ſp. 4. *Sydenh.* ſect. iv. cap. 1.
Variola diſcreta veſicularis, *Sauv.* ſp. 5.
Variola diſcreta cryſtallina, *Mead* de variol cap. 2.

Variola diſcreta verrucoſa, *Sauv.* ſp. 6. *Mead* ibid.

Variola diſcreta ſiliquoſa, *Sauv.* ſp. 7. *Friend* Oper. p. 358.

Variola diſcreta miliaris, *Sauv.* ſp. 8. *Helvet.* Obſ. ſp. 3.

224 Sp. II. *The Confluent* SMALL-POX.

Variola confluens, *Sauv.* ſp. 9.
Variolæ regulares confluentes, ann. 1667. *Sydenham*, ſect. iii. cap. 2.
Variolæ confluentes ſimplices, *Helvet.* Obſ. ſp. 1.
Variola confluens cryſtallina, *Sauv.* ſp. 10.
Variola japonica, *Kempfer.*
Veſiculæ divæ Barbaræ, *C. Pis*, Obſ. 149.
Variola confluens maligna, *Helvet.* Obſ. ſp. 1.
Variola confluens cohærens, *Sauv.* ſp. 11.
Variola confluens maligna, *Helvet.* ſp. 2.
Variola confluens nigra, *Sauv.* ſp. 12. *Sydenham*, ſect. v. cap. 4.
Variola confluens maligna, *Helvet.* ſp. 3.
Variola ſanguinea, *Mead.* de variolis, cap. 2.
Variola confluens corymboſa, *Sauv.* ſp. 13.
Variola confluens maligna, *Helvet.* ſp. 4.

Deſcription. In the diſtinct ſmall-pox, the diſeaſe begins with a ſynocha or inflammatory fever. It generally comes on about mid-day, with ſome ſymptoms of a cold ſtage, and commonly with a conſiderable languor and drowſineſs. A hot ſtage is ſoon formed, and becomes more conſiderable on the ſecond and third day. During this courſe children are liable to frequent ſtartings from their ſlumbers; and adults, if they are kept in bed, are diſpoſed to much ſweating. On the third day, children are ſometimes affected with one or two epileptic fits. Towards the end of the third day the eruption commonly appears, and gradually increaſes during the fourth; appearing firſt on the face, and ſucceſſively on the inferior parts, ſo as to be completed over the whole body on the fifth day. From the third day the fever abates, and againſt the fifth it entirely ceaſes. The eruption appears firſt in ſmall red ſpots hardly eminent, but by degrees riſing into pimples. There are generally but few on the face; but, even when more numerous, they are ſeparate and diſtinct from one another. On the fifth or ſixth day, a ſmall veſicle, containing an almoſt colourleſs fluid, appears on the top of each pimple. For two days theſe veſicles increaſe in breadth only, and there is a ſmall hollow pit in their middle, ſo that they are not raiſed into ſpheroidical puſtules till the eighth day. Theſe puſtules from their firſt formation continue to be ſurrounded with an exactly circular inflamed margin, which when they are numerous diffuſes ſome inflammation over the neighbouring ſkin; ſo as to give ſomewhat of a damaſk-roſe colour to the ſpaces between the puſtules. As the puſtules increaſe in ſize, the face ſwells conſiderably if they are numerous on it; and the eye-lids particularly are ſo much ſwelled, that the eyes are entirely ſhut. As the diſeaſe proceeds, the matter in the puſtules becomes by degrees more opaque and white, and at length aſſumes a yellowiſh colour. On the eleventh day the ſwelling of the face is abated, and the puſtules ſeem quite full. On the top of each a darker ſpot appears; and at this place the puſtule, on the 11th day, or ſoon after, is ſpontaneouſly broken, and a portion of the matter oozes out; in conſequence of which the puſtule is ſhrivelled, and ſubſides; while the matter oozing out dries, and forms a cruſt upon its ſurface. Sometimes only a little of the matter oozes out, and what remains in the puſtule becomes thick and even hard. After ſome days, both the cruſts and the hardened puſtules fall off, leaving the ſkin which they covered of a browniſh red colour; nor doth it reſume its natural colour till many days after. In ſome caſes where the matter of the puſtules has been more liquid, the cruſts formed from it are later in falling off, and the part they covered ſuffers ſome deſquamation, which occaſions a ſmall hollow or pit in it.

On the legs and hands the matter is frequently abſorbed; ſo that at the height of the diſeaſe, theſe puſtules appear as empty as veſicles. On the 10th and 11th days, as the ſwelling of the face ſubſides, a ſwelling ariſes in the hands and feet; but which again ſubſides as the puſtules come to maturity. When the puſtules on the face are numerous, ſome degree of pyrexia appears on the 10th and 11th days; but diſappears again after the puſtules are fully ripened, or perhaps remains in a very ſlight degree till the puſtules on the feet have finiſhed their courſe; and it is ſeldom that any fever continues longer in the diſtinct ſmall-pox. When the puſtules are numerous on the face, upon the ſixth or ſeventh day ſome uneaſineſs of the throat, with a hoarſeneſs of the voice, comes on, and a thin liquid is poured out from the mouth. Theſe ſymptoms increaſe with the ſwelling of the face; and the liquids of the mouth and throat becoming thicker are with difficulty thrown out; and there is at the ſame time ſome difficulty in ſwallowing, ſo that liquids taken in to be ſwallowed are frequently rejected or thrown out by the noſe. But all theſe affections of the fauces are abated as the ſwelling of the face ſubſides.

In the confluent ſmall-pox all the ſymptoms abovementioned are much more ſevere. The eruptive fever particularly is more violent; the pulſe is more frequent and more contracted, approaching to that ſtate of pulſe which is obſerved in typhus. The coma is more conſiderable, and there is frequently a delirium. Vomiting alſo frequently attends, eſpecially at the beginning of the diſeaſe. In very young infants epileptic fits are ſometimes frequent on the firſt days of the diſeaſe, and ſometimes prove fatal before any eruption appears, or they uſher in a very confluent and putrid ſmall-pox. But at the ſame time, it has been juſtly remarked by Dr Sydenham, and other accurate obſervers, that epileptic attacks more frequently precede diſtinct and mild than malignant and confluent ſmall-pox. The eruption appears in the confluent more early on the third day, and it is frequently preceded or accompanied with an eryſipetalous effloreſcence. Sometimes the eruption appears in cluſters, like the meaſles. When the eruption is completed, the pimples are always more numerous upon the face, and at the ſame time ſmaller and leſs eminent. Upon the eruption the fever ſuffers ſome remiſſion, but never goes off entirely; and after the fifth or ſixth day it increaſes again, and continues to be conſiderable throughout the remaining part of the diſeaſe. The veſicles formed on the top of the pimples appear ſooner ; and while they increaſe in breadth, they do not retain a circular, but are every way of an irregular figure. Many of them run into one another, inſomuch that very often the face is covered with one veſicle rather than with a number of puſtules. The veſicles, as far as they are any way ſeparated, do not ariſe to a ſpheroidal form, but remain flat, and ſometimes the whole of the face is of an even ſurface. When the puſtules are in any meaſure ſeparated, they are not bounded by an inflamed margin, but the part of the ſkin that is free from puſtules is commonly pale and flaccid. The liquor that is in the puſtules changes from a clear to an opaque appearance, and becomes whitiſh or browniſh, but never acquires the yellow colour and thick conſiſtence that appears in the diſtinct ſmall-pox. The ſwelling of the face, which only ſometimes attends the diſtinct ſmall-pox, always attends the confluent kind ; it alſo comes on more early, and ariſes to a greater height, but abates conſiderably on the tenth or eleventh day. At this time the puſtules or veſicles break and ſhrivel ; pouring out at the ſame time a liquor, which is formed into brown or black cruſts, which do not fall off for a long time after. Thoſe of the face, in falling off, leave the ſkin ſubject to a deſquamation, which pretty certainly produces pittings. On the other parts of the body the puſtules of the confluent ſmall-pox are more diſtinct than on the face ; but never acquire the ſame maturity and conſiſtence of pus as in the properly diſtinct kind.— The ſalivation, which only ſometimes attends the diſtinct ſmall-pox, very conſtantly attends the confluent ; and both the ſalivation and the affection of the fauces abovementioned are, eſpecially in adults, in a higher degree. In infants a diarrhœa comes frequently in place of a ſalivation.

In this kind of ſmall-pox there is often a very conſiderable putreſcency of the fluids, as appears from petechiæ, from ſerous veſicles, under which the ſkin ſhews a diſpoſition to gangrene, and from bloody urine or other hœmorrhages ; all of which ſymptoms frequently attend this diſeaſe. In the confluent ſmall-pox alſo, the fever, which had only ſuffered a remiſſion from the eruption to the maturation, at or immediately after this period is frequently renewed again with conſiderable violence. This is what has been called the *ſecondary fever*, and is of various duration and event.

Cauſes, &c. It is evident, that the ſmall-pox is originally produced by contagion ; and that this contagion is a ferment with reſpect to the fluids of the human body, which aſſimilates a great part of them to its own nature ; or, at leaſt, we have every reaſon to believe that a ſmall quantity of contagious matter introduced, is ſomehow multiplied and increaſed in the circulating fluids of the animal body. This quantity paſſes again out of the body, partly by inſenſible perſpiration, and partly by being depoſited in puſtules : The cauſes which determine more of the variolous matter to paſs by perſpiration, or to form puſtules, are probably certain circumbſtances of the ſkin, which determine more or leſs of the variolous matter to ſtick in it, or to paſs freely through it. The circumſtance of the ſkin, which ſeems to determine the variolous matter to ſtick in it, is a certain ſtate of inflammation depending much on the heat of it : thus we have many inſtances of parts of the body, from being more heated, having a greater number of puſtules than other parts. Thus parts covered with plaſters, eſpecially thoſe of the ſtimulant kind, have more puſtules than others. —Certain circumſtances, alſo, ſuch as adult age, and full living, determining to a phlogiſtic diatheſis, ſeem to produce a great number of puſtules, and *vice verſa*. It is therefore probable, that an inflammatory ſtate of the whole ſyſtem, and more particularly of the ſkin, gives occaſion to a greater number of puſtules ; and the cauſes of this may produce moſt of the other circumſtances of the confluent ſmall-pox, ſuch as the time of eruption, the continuance of the fever, the effuſion of a more putreſcent matter, and leſs fit to be converted into pus, together with the form and other circumſtances of the puſtules.

Prognoſis. The more exactly the diſeaſe retains the form of the diſtinct kind, it is the ſafer ; and the more completely the diſeaſe takes the form of the confluent kind, it is the more dangerous. It is only when the diſtinct kind ſhows a great number of puſtules on the face or otherwiſe, by fever or putreſcency, approaching to the circumſtances of the confluent, that the diſtinct kind is attended with any danger.

In the confluent kind the danger is always very conſiderable ; and the more violent and permanent the fever is, the greater the danger ; and eſpecially in proportion to the increaſe of the ſymptoms of putreſcency. When the putrid diſpoſition is very great, the diſeaſe ſometimes proves fatal before the eighth day ; but in moſt caſes death happens on the eleventh, and ſometimes not till the fourteenth or ſeventeenth.

Though the ſmall-pox may not prove immediately fatal, the more violent kinds are often followed by a morbid ſtate of the body, ſometimes of very dangerous event. Theſe conſequences, according to Dr Cullen, may be imputed ſometimes to an acrid matter produced by the preceding diſeaſe, and depoſited in different parts ; and ſometimes to an inflammatory diatheſis produced and determined to particular parts of the body.

Cure. The art of medicine hath never yet afforded a method of preventing the eruption of the ſmall-pox after the contagion is received ; all that can be done is, to render the diſeaſe more mild, which is generally effected by INOCULATION. It is not to be ſuppoſed that 225
the mere giving of the infection artificially could make any difference in the nature of the diſeaſe, was it not that certain precautions are commonly uſed in the caſe of thoſe who are inoculated, which cannot be uſed in the caſe of thoſe who receive them naturally.— Theſe meaſures, according to Dr Cullen, are chiefly the following.

1. The chooſing for the ſubject of inoculation perſons otherwiſe freed from diſeaſe, and not liable from their age or otherwiſe to any incidental diſeaſe.
2. The chooſing that time of life which is moſt favourable to a mild diſeaſe.
3. The chooſing for the practice a ſeaſon moſt favourable to a mild diſeaſe.

4. The preparing the perſon to be inoculated, by enjoining abſtinence from animal food for ſome time before inocculation.

5. The preparing the perſon by courſes of mercurial and antimonial medicines.

6. The taking care at the time of inoculation to avoid cold, intemperance, fear, or other circumſtances which might aggravate the future diſeaſe.

7. After theſe preparations and precautions, the chooſing a fit matter to be employed in inoculation, by taking it from a perſon of a ſound conſtitution and free from any diſeaſe, or ſuſpicion of it; by taking it from a perſon who has had the ſmall-pox of the moſt benign kind; and laſtly, by taking the matter from ſuch perſon as ſoon as it has appeared in the puſtules, either on the part inoculated, or on other parts of the body.

8. The introducing, by inoculation, but a ſmall portion of the contagious matter.

9. After inoculation, the continuing of vegetable diet, and the employment of mercurial and antimonial medicines, and at the ſame time employing frequent purging.

10. Both before and after inocculation, taking care to avoid external heat, either from the ſun, artificial fires, warm chambers, much clothing, or being much in bed; and on the contrary, expoſing the perſon to a free and cool air.

11. Upon the appearance of the eruptive fever, the rendering that moderate by the employment of purgatives; by the uſe of cooling and antiſeptic acids; and eſpecially by expoſing the perſon frequently to a cool and even a cold air, at the ſame time giving freely of cold drink.

12. After the eruption, the continuing the application of cold air, and the uſe of pugatives, during the courſe of the diſeaſe, till the puſtules are fully ripened.

On theſe meaſures Dr Cullen obſerves, that, as the common infection may often ſeize perſons under a diſeaſed ſtate, which may render the ſmall-pox more violent, it is evident that inoculation muſt have a great advantage by avoiding ſuch concurrence. But as the avoiding of this may in the mean time frequently leave perſons expoſed to the common infection, it is well worth while to enquire what are the diſeaſed ſtates which ſhould reſtrain from the practice of inoculation. This is not yet ſufficiently aſcertained; for it hath been obſerved, that the ſmall-pox has often occurred with a diſeaſed ſtate of the body, without being thereby rendered more violent; and it hath alſo been obſerved, that ſome diſeaſes of the ſkin are equally innocent. Dr Cullen is of opinion that they are diſeaſes of the febrile kind, or ſuch ailments as induce or aggravate a febrile ſtate, that eſpecially give the concurrence which is moſt dangerous with the ſmall-pox. He is alſo of opinnion, that though a perſon be in a diſeaſed ſtate, if that ſtate be of uncertain nature and effect, and at the ſame time the ſmall-pox are very common in the neigbourhood, ſo that it muſt be extremely difficult to guard againſt the common infection it will always be ſafer to give the ſmall-pox by inoculation than to leave the perſon to take them by the common infection.

Though inoculation has been practiſed with ſafety upon perſons of all ages, yet there is reaſon to conclude, that adults are more liable to a violent diſeaſe than perſons of younger years. At the ſame time it is obſerved, that children, in the time of their firſt dentition, are liable, from the irritation of that, to have the ſmall-pox rendered more violent; and that infants, before the time of dentition, upon receiving the contagion of the ſmall-pox, are liable to be afflicted with epileptic fits, which frequently prove fatal. Hence it is evident, that though circumſtances may admit and approve of inoculation at any age, yet for the moſt part it wil be advantageous to chooſe perſons after the firſt dentition is over, and before the time of puberty. But in large cities in particular, if the operation be delayed till after dentition, the patient muſt run many riſks of accidental infection, and thus many will be cut off by the natural ſmall-pox who might have been ſaved by more early inoculation. Accordingly, in towns eſpecially, it is now the common practice to inoculate infants when only three or four months old; and indeed accidents ſo rarely happpen, that it is almoſt impoſſible to conceiv ethat greater ſucceſs can be obtained at any other period of life.

The operation of inoculation may be performed at any ſeaſon of the year; yet as it is certain that the cold of winter may increaſe the inflammatory, and the heats of ſummer increaſe the putreſcent, ſtate of the ſmall-pox it is highly probable that inoculation may have ſome advantage from avoiding the extremes either of cold or heat.

As the uſe of animal-food may increaſe both the inflammatory and putreſcent ſtate of the human body ſo it muſt render perſons, in receiving the contagion of the ſmall-pox, leſs ſecure againſt a violent diſeaſe; and therefore inocculation may derive ſome advantage by enjoining abſtinence from animal-food for ſome time before the operation is performed; But Dr Cullen is of opinnion, that a longer time is neceſſary than what is commonly preſcribed.

Mercurial and antimonial preparations may have ſome effect in determining to a more free perſpiration and therefore may be of ſome uſe in preparing a perſon for the ſmall-pox; but there are many obſervations which render their uſe doubtful. The quantity of both theſe medicines, particularly the antimony, commonly employed, is too inconſiderable to have any effects. Mercurials indeed have been often employed more freely; but even their ſalutary effects have not been evident, and they have ſometimes been manifeſtly productive of miſchief. It is therefore much to be doubted, whether inoculation really derives any benefit from theſe preparatory courſes or not.

It has been often obſerved, in the caſe of almoſt all contagions, that cold, intemperance, fear, and ſome other circumſtances, concurring with the application of the contagion, have greatly aggravated the future diſeaſe; it muſt undoubtedly be the ſame in the caſe of the ſmall-pox: and it is certain that inoculation muſt derive a great advantage, perhaps its principal one, from avoiding the concurrences above mentioned.

It has commonly been ſuppoſed, that inoculation derives ſome advantage from the choice of the matter employed in it; but it is very doubtful if any choice be here neceſſary, or can be of any benefit in determining the ſtate of the diſeaſe. It is not indeed probable that there is any difference of contagion producing the ſmall-pox; for there are innumerable inſtances of the contagion, ariſing from a perſon who labours under the diſtinct ſmall-pox producing the confluent kind, and the contrary. Since the practice of inoculation hath been introduced, it has alſo been obſerved that the ſame variolous matter would in one perſon produce the diſtinct and in another the confluent ſmall-pox. It is therefore highly probable, that the difference of the ſmall-pox does not much depend upon any difference of the contagion, but upon ſome difference in the ſtate of the perſons to whom it is appplied, or in the ſtate of certain circumſtances concuring with the application of the contagion.

Some have ſuppoſed, that inoculation has an advantage over the natural infection, by introducing only a ſmall portion of contagious matter into the body; but this is by no means well aſcertained. It is not known what quantity of contagion is introduced into the body by the common infection of the ſmall-pox; and it is probable the quantity is not great; nor, though it were larger than that thrown in by inoculation; is it certain what the effects would be. A certain quantity of ferment may be neceſſary to excite fermentation in a given maſs; but when that quantity is given the fermentation and aſſimilation are extended to the whole maſs; and we do not find that a greater quantity than is juſt neceſſary, either increaſes the activity of the fermentation, or more certainly ſecures the aſſimilation of the whole. In the caſe of the ſmall-pox a conſiderable difference in the quantity of the contagion introduced hath not ſhown any effects in modyfying the diſeaſe.

Purging has the effect of diminiſhing the activity of the ſanguiferous ſyſtem, and of obviating the inflammatory ſtate of it; and therefore it is probable; that the frequent uſe of cooling purgatives gives a conſiderable advantage to the practice of inoculation and probably this is alſo obtained by diminiſhing the determination to the ſkin. It ſeems alſo probable, that mercurials and antimonials are uſeful only as they make part of the purging courſe.

It is probable that the ſtate of the ſmall-pox depends very much upon the ſtate of the eruptive fever, and particularly in avoiding the inflammatory ſtate of the ſkin; and therefore it is alſo probable, that the meaſures taken for moderating the eruptive fever, and inflammatory ſtate of the ſkin, are the greateſt improvement which has been made in the practice of inoculation. The tendency of purging, and the uſe of acids to this purpoſe, is ſufficiently obvious; and upon the ſame grounds we ſhould ſuppoſe that bloodletting might be uſeful; but probably this has been omitted, and perhaps other remedies might be ſo, ſince we have found a more powerful and effectual one in the application of cold air and the uſe of cold drink.

It hath been the practice of inoculators to continue the uſe of purgatives and the application of cold air after the eruption; but it cannot be ſaid to give any particular advantages to inoculation, and the employment of purgatives ſeems often to have led to an abuſe. When the ſtate of the eruption is determined, when the number of puſtules is very ſmall, and the fever has entirely ceaſed, the ſafety of the diſeaſe may be ſaid to be aſcertained, and further remedies abſolutely ſuperfluous: in ſuch caſes therefore the uſe of purgatives is unneceſſary, and may be hurtful.

It remains now only to conſider the treatment of the ſmall-pox, when the ſymptoms are violent, as may ſometimes happen, even after inoculation and every remedy and precaution have been uſed. The cauſe of this is not aſcertained, but it ſeems to be a putreſcent tendency of the fluids. When therefore, from the prevailing of ſmall-pox as an epidemic, and more eſpecially when it is known that a perſon not formerly affected with the diſeaſe has been expoſed to the infection if ſuch perſon ſhould be attacked with the ſymptoms of fever, there can be little doubt that it is the fever of the ſmall-pox, and therefore he is to be treated in every reſpect as if he had received the diſeaſe by inoculation. He is to be freely expoſed to cool air, to be purged, and to have cooling acids given liberally. If theſe meaſures moderate the fever, nothing more is neceſſary: but if the nature of the fever be uncertain; of if, with ſuſpicions of the ſmall-pox, the fever be violent; or even if, knowing the diſtemper to be the ſmall-pox, the meaſures above-mentioned do not moderate the fever ſufficiently; veneſection will be proper; and more eſpecially if the perſon be an adult, of a plethoric habit, and accuſtomed to full living. in the ſame circumſtances it will always be proper to give a vomit; which is uſeful in the beginning of all fevers, and eſpecially in this, where a determination to the ſtomach appears by pain and ſpontaneous vomiting.

It frequently happens, eſpecially in infants, that, during the eruptive fever of the ſmall-pox, convulſions occur. Of theſe, if only one or two fits appear on the evening preceding the eruption, they give a prognoſtic of a mild diſeaſe, and require no remedy; but if they occur more early, are violent, and frequently repeated, they are very dangerous, and require a ſpeedy remedy; and here bleeding and bliſtering are of no ſervice, the only effectual medicine is an opiate given in a large doſe.

Theſe are the remedies neceſſary during the eruptive fever; and if upon the eruption, the puſtules on the face are diſtinct, and their number few, the diſeaſe requires no further remedies. But when, upon the eruption, the number of pimples on the face is conſiderable, when they are not diſtinct, and eſpecially if, upon the fifth day, the fever does not ſuffer a conſiderable remiſſion; the diſeaſe ſtill requires a great deal of attention.

If, after the eruption, the fever ſhall ſtill continue the avoiding of heat and the continuing to expoſe the body to a cool air will ſtill be proper. If the fever be conſiderable, with a full hard pulſe, in an adult perſon, a bleeding will be neceſſary, and more certainly a cooling purgative; but it will be ſeldom neceſſary to repeat the bleeding, as a loſs of ſtrength very ſoon comes on; but the repetition of a purgative, or the frequent uſe of laxative glyſters, is commonly advantageous.

When a loſs of ſtrength, with other marks of a putreſcent tendency of the fluids, appears, the Peruvian bark muſt be given in ſubſtance, and in large quantity,

quantity. In the ſame caſe, the uſe of acids and of nitre is advantageous, and commonly it is proper alſo to give wine very freely. From the fifth day of the diſeaſe throughout the whole courſe of it, it is proper to give an opiate once or twice a day; taking care at the ſame time to obviate coſtiveneſs, by purgatives or by laxative glyſters. From the eighth to the eleventh day of a violent diſeaſe, it will be proper to lay on bliſters ſucceſſively on different parts of the body, and that without regard to the parts being covered with puſtules. Bliſters are alſo to be applied to the external fauces, in caſe of difficult deglutition, and viſcid ſaliva and mucus, which are thrown out with difficulty, at the ſame time that detergent gargles are to be diligently uſed. During the whole courſe of this diſeaſe, when a conſiderable fever is preſent, antimonial medicines, in nauſeating doſes, have by ſome been alleged to be employed with advantage; and in this way they have often the effect of moving the belly. But the great diſtreſs which patients ſuffer from a ſtate of conſtant nauſea is hardly to be borne; and every advantage which can be had from this practice may be obtained by eaſier means.

The remedies abovementioned are frequently proper from the fifth day till the ſuppuration be finiſhed. But after that period the fever is ſometimes continued and increaſed; or ſometimes, when there was little or no fever before, a fever now ariſes and continues with conſiderable danger; this is called the *ſecondary fever*, and requires a particular treatment.

When the ſecondary fever follows the diſtinct ſmall-pox, and the pulſe is full and hard, the caſe is to be treated as an inflammatory affection, by bleeding and purging; but the ſecondary fever which follows the confluent kind is to be conſidered as a putrid diſeaſe and bleeding is improper. Some purging may be neceſſary, but the remedies chiefly to be depended upon are the Peruvian bark and acids. When the ſecondary fever firſt appears, whether after a diſtinct or confluent ſmall-pox, it is uſeful to exhibit an antimonial emetic in nauſeating doſes, but in ſuch a manner as to produce ſome vomiting. For avoiding the pits which frequently follow the ſmall-pox, no method hitherto propoſed ſeems to be ſufficiently certain.

On the ſubject of inoculation, Baron Dimſdale, a very celebrated writer, informs us, that were it left to his choice, he would decline inoculating children under two years old; becauſe within that period they are expoſed to all the dangers of dentition, fevers, fluxes, convulſions, and other accidents, ſufficiently difficult in themſelves to manage in ſuch tender ſubjects.

In regard to conſtitution, Baron Dimſdale obſerves, that greater liberties may be taken than were formerly judged admiſſible. Perſons afflicted with various chronic complaints, of ſcrophulous ſcorbutic and arthritic habits; perſons of unwieldy corpulency, and of intemperate irregular lives; have all paſſed through this diſeaſe with as much facility as the moſt temperate healthy, and regular. But thoſe who labour under any acute or critical diſeaſe, or its effects, are obviouſly unfit and improper ſubjects. So likewiſe are thoſe in whom are evident marks of corroſive acrimonious humours, or who have an evident debility of the whole frame from inanition or any other cauſe. All ſuch require to be treated in a particular manner previous to the introduction of this diſeaſe. Conſtitutions diſpoſed to frequent returns of intermittents, ſeem likewiſe juſtly exceptionable; eſpecially as the preparatory regimen may in ſome habits increaſe this tendency. Baron Dimſdale, however, has known inſtances of ſevere ague-fits attacking perſons between the inſertion of the matter and the eruption of the ſmall-pox, and even during maturation, when the Peruvian bark has been given liberally and with much ſucceſs; the principal buſineſs, in the mean time, ſuffering no injury or interruption.

Among the circumſtances generally conſidered as more or leſs propitious to inoculation, the ſeaſon of the year has been reckoned a matter of ſome importance, Spring and autumn have been generally recommended, as being the moſt temperate ſeaſons; the cold of winter and the ſummer heats having been judged unfavourable for this purpoſe. But Baron Dimſdale remarks, that experience does not juſtify thoſe opinions; for, according to the beſt obſervations he has been able to make, inoculated perſons have generally had more puſtules in ſpring than at any other time of the year; and epidemic diſeaſes being commonly moſt frequent in autumn, eſpecially fluxes, intermittents, and ulcerated ſore throats (all which are liable to mix more or leſs with the ſmall-pox), the autumn, upon this account does not ſeem to be the moſt favourable ſeaſon in general.

Baron Dimſdale's opinion is, that conſidering the ſurpriſing and indiſputable benefits ariſing at all times to patients in the ſmall-pox, from the free admiſſion of freſh cool air and evacuations, we may ſafely inoculate at all ſeaſons, provided care be taken to ſcreen the patients as much as poſſible from heat in ſummer, and to prevent them from keeping themſelves too warm and too much ſhut up, as they are naturally diſpoſed to do, from the weather in winter. When ſeaſons, however, are marked with any peculiar epidemics, of ſuch a kind eſpecially as may render a mild diſeaſe more untractable, it may perhaps be moſt prudent not to inoculate while ſuch diſeaſes are prevalent.

In directing the preparatory regimen, Baron Dimſdale principally aims at the following points, viz. To reduce the patient, if in high health, to a lower and more ſecure ſtate; to ſtrengthen the conſtitution, if too low; to correct what appears vitiated; and to clear the ſtomach and bowels as much as may be, from all crudities and their effects. With this view he orders ſuch of his patients as conſtitute the firſt claſs abovementioned, and who are by much the majority, to live in the following manner: To abſtain from all animal food, including broths, and likewiſe butter, and cheeſe, from all fermented liquors, excepting ſmall-beer, which is allowed ſparingly; and from all ſpices, and whatever is endued with a manifeſt heating quality. The diet is to conſiſt of pudding, gruel, ſago, milk, rice-milk, fruit-pyes, greens, roots, and vegetables of any of the kinds in ſeaſon, prepared or raw. Eggs, though not to be eaten alone, are allowed in puddings, and butter in pye-cruſt. The patients are to be careful that they do not eat ſuch a quantity as to overload their ſtomachs, even of this kind of food. Tea, coffee, or chocolate, are permitted for breakfaſt, to thoſe who chooſe or are accuſtomed to them.

In this manner they are to proceed about nine or ten days before the operation; during which period, at nearly equal diſtances, they are directed to take three doſes of the following powder, either made into pills or mixed with a little ſyrup or jelly, at bed-time, and a doſe of Glauber's ſalts diſſolved in thin water-gruel, each ſucceeding morning.

The powder is compoſed of eight grains of calomel, the ſame quantity of the compound powder of crab's claw's, and one eighth part of a grain of emetic tartar. Inſtead of the latter, Baron Dimſdale has ſometimes ſubſtituted two grains of precipitated ſulphur of antimony. In order to facilitate the diviſion of the doſes, a large quantity is prepared at once, and great care taken that the ſeveral ingredients be well mixed.

This quantity is uſually ſufficient for a healthy ſtrong man; and the doſe muſt be leſſened for women or children, according to their age and ſtrength, as well as for perſons advanced in years.

The firſt doſe is generally ordered at the commencement of the courſe; the ſecond three or four days after; and the third about the eighth or ninth day. The Baron chooſes to inoculate the day after the laſt doſe has been taken. On the days of purging, broths are to be allowed, and the patients are deſired to abſtain from unprepared vegetables.

What has been ſaid concerning the preparation, muſt be conſidered as proper only for the young or middle-aged, in a good ſtate of health: but among thoſe who are deſirous of inoculation, are often found tender, delicate, and weakly women; men of bad ſtamina, valetudinarians by conſtitution, by illneſs, or intemperance; alſo aged perſons, and children; and for all ſuch a very different treatment muſt be directed. Here a milder courſe of medicine, rather of the alterative than purgative kind, is preferable; and in many inſtances, an indulgence in ſome light animal-food, with a glaſs or two of wine in caſe of lowneſs, is not only allowable, but neceſſary to ſupport a proper degree of ſtrength, eſpecially in advanced age.

Children, whoſe bowels are often tender, and ought not to be ruffled by ſtrong purges, yet require a mild mercurial and bear it well. Beſides emptying the bowels of crudities, it is a good ſecurity againſt worms and their effects, which ſometimes produce very alarming and even fatal diſorders.

Inattention to the particular ſtate of health of thoſe who are entering upon the preparatory courſe, has been productive of great miſchief. This is chiefly obſervable reſpecting the indiſcreet uſe of mercurials, by which a ſalivation has often been raiſed, to the riſk of impairing good conſtitutions, and the ruin of ſuch as were previouſly weak and infirm. The diſtinctions and treatment neceſſary, will be obvious to thoſe who are acquainted with the animal economy and medical practice.

The time of menſtruation has generally been the guide in reſpect to the inoculation of women, that the whole of the diſeaſe may be over within the menſtrual period. Baron Dimſdale informs us, that he obſerves this rule, when he can chooſe his time without any inconvenience, and he inoculates ſoon after the evacuation ceaſes; though he has no reaſon to decline performing the operation at any time.

Women with child have likewiſe been inoculated, and done well; but the ſtate of pregnancy ſeems unfavourable to the proceſs, which ought therefore not to be hazarded without ſome urgent reaſon. Baron Dimſdale has not inoculated any woman whom he knew to be pregnant; but on ſome who concealed their pregnancy he has performed the operation, without producing a miſcarriage; the hope of which event, he ſuſpects, had rendered them deſirous of the proceſs. One of thoſe had a child born nine weeks after inoculation at the full time, with diſtinct marks of the diſeaſe, though the mother had very few puſtules.

The manner moſt commonly practiſed in Britain for communicating the ſmall-pox by inoculation, has of late been the following: a thread was drawn thro' a ripe puſtule, and well moiſtened with matter. A piece of this thread was inſinuated into a ſuperficial inciſion made in one or both arms, near the part where iſſues are uſually fixed; and being covered with a a plaſter, was three left for a day or two.

Very different methods of inoculation, however, are purſued; two of which Baron Dimſdale has frequently practiſed and deſcribes; but he informs us, that the following has proved ſo invariably ſucceſsful, as to induce him to give it the preference.

The patient to be infected being in the ſame houſe, and if no objection be made to it, in the ſame room, with one who has the diſeaſe, a little of the variolous matter is taken from the place of inſertion, if the ſubject be under inoculation; or a puſtule, if in the natural way, on the point of a lancet, ſo that both ſides of the point are moiſtened.

With this lancet an inciſion is made in that part of the arm where iſſues are uſually placed, deep enough to paſs through the ſcarf-ſkin, and juſt to touch the ſkin itſelf; and in length as ſhort as poſſible, not more than one eighth of an inch.

The little wound being then ſtretched open between the finger and thumb of the operator, the inciſion is moiſtened with the matter, by gently touching it with the flat ſide of the infected lancet. This operation is generally performed in both arms, and ſometimes in two places in one arm, a little diſtant from each other. For as Baron Dimſdale has not obſerved any inconvenience from two or three inciſions, he ſeldom truſts to one; that neither he nor his patient may be under any doubt about the ſucceſs of the operation from its being performed in one place only.

Baron Dimſdale has alſo tried the following method, with the ſame ſucceſs as that above deſcribed; but he does not ſo much approve of it, becauſe he has been credibly informed that it has ſometimes failed in the practice of others. A lancet being moiſtened with the variolous fluid in the ſame manner as in the other, is gently introduced, in an oblique manner, between the ſcarf and true ſkin, and the finger of the operator is applied on the point, in order to wipe off the infection from the lancet, when it is withdrawn. In this method, as well as in the former, a little blood will ſometimes appear; but Baron Dimſdale neither draws blood with deſign, nor does he think there is any neceſſity of wiping it off before the matter is introduced.

In both theſe ways of inoculating, neither plaſter, bandage, nor covering is applied, nor in any reſpect neceſſary.

Baron Dimſdale informs us, that thoſe methods of producing this diſeaſe have never once failed him; and experience has ſufficiently proved that there is no danger from additional infection by the natural diſeaſe at the ſame time. He therefore makes no ſcruple of having the perſon to be inoculated, and the perſon from whom the infection is to be taken, in the ſame room; nor has he ever obſerved any ill conſequence attending this practice. But he adviſes the inoculated patients (though perhaps there be no neceſſity for that precaution) to be afterwards ſeparated from places of infection till certain ſigns of ſucceſs appear, when all reſtraint is removed, there being then no danger from accumulation.

Baron Dimſdale remarks, that it ſeems to be of no conſequence whether the infecting matter be taken from the natural or inoculated ſmall-pox. He has uſed both, and never has been able to diſcover the leaſt difference, either reſpecting the certainty of infection, the progreſs, or the event. He therefore takes the infection from either, as opportunity offers, or at the option of the patients or their friends.

Neither is it of any conſequence whether the matter be taken before, or at the criſis of, the diſtemper. It is generally ſuppoſed, that the ſmall-pox is not infectious till after the matter has acquired a certain degree of maturity; and in the common method of inoculation this is ſo much attended to, that when the operation has proved ineffectual, the failure has been aſcribed to the unripeneſs of the matter.

But, as the author remarks, it appears very clearly from the preſent practice of inoculation, that ſo ſoon as any moiſture can be taken from the infected part of an inoculated patient, previous to the appearance of any puſtules, and even previous to the eruptive fever, this moiſture is capable of communicating the ſmall-pox with the utmoſt certainty. Baron Dimſdale has taken a little clear fluid from the elevated pellicle on the inciſed part, even ſo early as the fourth day after the operation; and has at other times uſed matter fully digeſted at the criſis, with equal ſucceſs. In general, however, he prefers taking the matter for infection during the eruptive fever, as he ſuppoſes it at that time to have its utmoſt activity.

In all caſes, when he takes matter from an inoculated perſon, it is from the place where it was inſerted; as he is always ſure to find infection there if the diſeaſe ſucceeds, and always of ſufficient energy.

It may appear ſtrange that no bandage, dreſſing, or application whatſoever, is uſed to the part infected; but that the moſt ſimple inciſion being made, and moiſtened with the ſmalleſt particle of the recent fluid matter, the whole is committed to nature. This method, however, the Baron obſerves, is perfectly right: becauſe the application of either plaſter or unguent, as is the uſual practice, will occaſion an inflammation on ſome ſkins; and, in all, tend to disfigure the natural appearance of the inciſion, and prevent our forming a proper judgment of the progreſs of the infection.

If neither an inoculated patient be at hand, nor any one in the neighbourhood has a diſtinct kind of the natural diſeaſe, a thread may be uſed as in the common manner, provided it be very recently infected; but Baron Dimſdale is of opinion, that the thread ought to be uſed as ſoon as poſſible after being charged with the infecting matter.

The method of inoculation recommended by Baron Dimſdale is now almoſt univerſally adopted; or at leaſt if any change has taken place, the operation is, if poſſible, ſtill more ſimplified. Without the trouble of bringing to the ſame houſe both the perſon from whom the contagion is to be taken and the perſon to whom it is to be given, the operator in general carries the matter about with him on what is called a *reſervoir lancet*. For this purpoſe a common lancet may be employed; but one, the blade of which is accurately incloſed in a metallic caſe, ſo conſtructed as to prevent the acceſs of the air, and at the ſame time not to rub off the matter, is certainly preferable. The infectious matter on this lancet is gently moiſtened by holding it for a few ſeconds over the ſteam of warm water; and by rubbing on it the point of another lancet, as much is taken off as is ſufficient for giving the diſeaſe, which is done by introducing this infected point under the ſcarf-ſkin, in the manner Baron Dimſdale has recommended. Where freſh matter can be had, it is always preferable; but where this cannot be obtained, a lancet may be infected from a dry puſtule, though kept for many months, by moiſtening it in warm water; particularly if care has been taken to preſerve it from the action of external air by keping it in a cloſe phial.

A due attention to the progreſs of infection, diſcoverable by the part where the operation was performed, is a neceſſary circumſtance; becauſe a juſt prognoſtic may thence be ſometimes formed of the future ſtate of the diſtemper, and indications may be taken from the different appearances on the arm, that will enable us to prevent inconveniences.

Baron Dimſdale obſerves, that the former method of covering the place of inciſion with a plaſter, and continuing upon it dreſſings of one ſort or other, prevented much uſeful information of this kind. They precluded any judgment by the touch, and ſometimes rendered that by the eye equivocal.

The day after the operation is performed, though it takes effect, little alteration is diſcoverable, On the ſecond day, if the part be viewed with a lens, there generally appears a kind of orange-coloured ſtain about the inciſion, and the ſurrounding ſkin ſeems to contract. At this time Baron Dimſdale uſually gives the following medicine at going to bed, either mixed with a little of any kind of jelly, or more frequently made into a pill.

> Calomel, and compound powder of crab's-claws, of each three grains; emetic tartar, one-tenth of a grain.

A quantity of this medicine ſhould be carefully prepared at once, in order to make the diviſion more exact.

On the fourth or fifth day, upon applying the finger, a hardneſs is perceptible to the touch. The patient feels an itching on the part, which appears ſlightly inflamed; and under a kind of veſication is ſeen a little clear fluid, the part reſembling a ſuperficial burn. About the ſixth, moſt commonly ſome pain and ſtiffneſs is felt in the axilla; a circumſtance which not only foretels the near approach of the eruptive ſymptoms, but is a ſign of a favourable progreſs of the diſeaſe. Sometimes on the ſeventh, oftener on the eighth day, ſymptoms of the eruptive fever appear; ſuch as ſlight remitting pains in the head and back, ſucceeded by tranſient ſhivering and alternate heats, which continue in a greater or leſs degree till the eruption be perfected. At this time alſo it is uſual for the patient to complain of a very diſagreeable taſte in his mouth, the breath is always fetid, and there enſues a ſmell peculiar to the variolous eruptive fever.

The inflammation in the arms at this time ſpreads faſt; and, upon viewing it with a good glaſs, the inciſion for the moſt part appears ſurrounded with an infinite number of ſmall confluent puſtules, which increaſe in ſize and extent as the diſeaſe advances. On the tenth or eleventh day, a circular or oval effloreſcence is uſually diſcovered ſurrounding the inciſion, and extending ſometimes near half round the arm, but more frequently to about the ſize of a ſhilling; and being under the cuticle, is ſmooth to the touch and not painful. This appearance alſo is favourable. It accompanies eruption; every diſagreeable ſymptom ceaſes; and at the ſame time it certainly indicates the whole affair to be over, the pain and ſtiffneſs in the axilla alſo going off.

The feveriſh ſymptoms are for the moſt part ſo mild, as ſeldom to require any aſſiſtance, except a repetition of the ſame medicine that was directed on the ſecond night after the operation; and next morning the following laxative draught ſhould be given, to procure three or four ſtools.

Infuſion of ſenna two ounces, manna half an ounce, tincture of jalap two drachms.

Theſe are given as ſoon as the eruptive ſymptoms are perceivable, if they ſeem to indicate any uncommon degree of vehemence.

It has been obſerved, that by attending to the progreſs of infection, we may in general be able to prognoſticate with ſome degree of certainty the iſſue of the diſtemper. Particular incidents will ever happen, but not ſufficient to invalidate the propriety of general rules.

If the appearances already deſcribed are obſerved early, a very favourable event may be expected; but it happens in ſome caſes, that the ſucceſs of the inoculation is barely perceptible, the colour about the wound remaining pale, inſtead of changing to red or inflamed; the edges of the inciſion ſpread but little, they remain almoſt entirely flat, and are attended neither with itching nor uneaſineſs of any kind. Nay, ſometimes on the fifth, and even the ſixth day, the alteration is ſo little as to render it doubtful whether the infection has taken place.

When matters are in this ſtate, Baron Dimſdale obſerves the appearance is unfavourable, implying a late and more untoward diſeaſe: To prevent which, he directs the powder or pill to be taken every night; and in caſe it fails to operate by ſtool, or there be the leaſt diſpoſition to coſtiveneſs, an ounce of Glauber's ſalts, or more commonly the laxative draught already mentioned, is given in the morning, once or twice, as the caſe may require. This courſe forwards the inflammation, which is always a deſirable circumſtance; it being in general obſerved, that an early progreſs on the arm, and an early commencement of the eruptive complaints, portend that the diſtemper will be mild and favourable; and on the contrary, when both are late, the ſymptoms he tells us are uſually more irregular and unfavourable.

Further experience, however, has by no means fully confirmed his oponion in this particular. On the contrary, even where the progreſs of infection in the arm has been uncommonly ſlow, a diſeaſe in the mildeſt poſſible form has ſucceeded. There is therefore no good reaſon why a practitioner ſhould be alarmed at an uncommonly ſlow progreſs, or ſhould in ſuch inſtances employ more internal remedies than he would do in other caſes. And ſome, whoſe practice in inoculation has been very extenſive, have even remarked, that when infants are inoculated, they have never obſerved epileptic acceſſions, the moſt alarming forerunners of the diſeaſe, in thoſe caſes where the progreſs of the arm has been ſlow.

The management recommended by Baron Dimſdale at the period of eruption differing eſſentially from that of former practitioners, and being a matter of great importance, he gives the following explicit directions on this head, adviſing that they may be purſued with firmneſs and moderation.

Inſtead of the patient being confined to his bed or his room, when the ſymptoms of the eruptive fever come on, he is directed, as ſoon as the purging medicine has operated, to keep abroad, as much as he can bear, in the open air, be it ever ſo cold; always taking care not to ſtand ſtill, but to walk about moderately while abroad. He is alſo directed, if thirſty, to drink cold water.

Baron Dimſdale obſerves, that this treatment ſeems as hard at firſt to the patients as it muſt appear ſingular to thoſe who are unacquainted with ſuch practice; but the effects are ſo ſalutary, ſo conſtantly confirmed by experience, and an eaſy progreſs through every ſtage of the diſeaſe depends ſo much upon it, that he admits of no exception, unleſs the weather be extremely ſevere and the conſtitution very delicate. He adds, it is indiſputably true, that, in the few inſtances where the ſymptoms of eruption have run very high, the patients being averſe to any motion, and fearing the cold as the greateſt evil; yet when, under thoſe circumſtances, he has perſuaded them to riſe out of bed, and go out of doors, though led ſometimes by two aſſiſtants, and has allowed them to drink as much cold water as they choſe, they have not ſuffered the leaſt unfavourable accident: on the contrary, after they have been prevailed upon to comply with thoſe directions, they find their ſpirits revived; an inclination for nouriſhment returns; they reſt well; a gentle ſweat ſucceeds, accompanied with a favourable eruption; and the fever ſeems to be entirely extinguiſhed.

Cool regimen during the eruptive fever is now almoſt univerſally adopted; but like other uſeful remedies it has not unfrequently been abuſed: And practitioners ought never to forget, that inoculated patients are not, more than the reſt of the human ſpecies, exempted from injuries from cold, which is unqueſtionably a powerful cauſe of diſeaſe. Unleſs, therefore, in caſes where very conſiderable morbid heat is induced by the eruptive fever, by which a temporary defence is unqueſtionably afforded againſt the action of external cold, the bad effects which may reſult from it are never to be overlooked. And there is even reaſon to believe, as may indeed be inferred from Baron Dimſdale's obſervations, that the diſeaſe is more moderated by the action of pure and free air than by cold. Accordingly inoculation is performed with very great ſucceſs even in the warmeſt ſeaſons and ſituations of warm climates.

In general, the complaints in this ſtate are very moderate, and attended with ſo little illneſs that the patient eats and ſleeps well the whole time. A few puſtules appear, ſometimes equally diſpoſed; ſometimes the inflammations on the arms ſpread, and are ſurrounded with a few puſtules, which gradually advance to maturity; during which time, for the moſt part, the eruption proceeds kindly, and there is much more difficulty to reſtrain the patients within due bounds, and prevent their mixing with the public, thereby ſpreading the infection, than there was at firſt to prevail upon them to go abroad. During this time medecine is ſeldom wanted; the cooleſt air ſeems the beſt cordial; and if any uncommon languor happens, a baſon of ſmall broth, or a glaſs of wine, is allowed in the day, or ſome white wine whey at bed-time; which are indeed at any time allowed to tender, aged or weakly perſons.

With theſe exceptions, the patients are hitherto kept very ſcrupulouſly to the diet at firſt directed. But after the eruption is completed, they are, if occaſion requires, indulged in a little well boiled meat of the lighteſt kind, as chicken, veal, or mutton.

The abovementioned regimen, the cooling alterative purges, and the free uſe of cool air at the ſeaſon of eruption, almoſt univerſally prevent either alarming ſymptoms or a large crop of puſtules. Baron Dimſdale has ſeen a few with ſuch a quantity of puſtules, though diſtinct that he has neither adviſed nor allowed them to go out of the houſe. But the generality of his patients, where the eruptions are few, amuſe themſelves abroad, within proper limits, with the puſtules upon them.

This practice, however, the Baron neither enjoins nor maintains to be neceſſary; but he has not been able to obſerve that any inconvenience has ariſen from it. He alſo informs us, that, how ſtrange ſoever it may appear, thoſe who are moſt adventurous, ſeem to enjoy better ſpirits, and are more free from complaints, than others who are inclined to keep within doors.

Thoſe who have the diſeaſe in the ſlighteſt manner firſt deſcribed, viz. without any appearance of eruption but on the inoculated part, are ſoon permitted to go about their uſual affairs: and many inſtances have happened of very induſtrious poor men, who have immediately returned to their daily labour, with a caution not to intermix with thoſe who have not had the diſtemper, for fear of ſpreading it; and with injunctions to take, two or three times, of the purge already directed, or as many doſes of Glauber's ſalts. Thoſe who have the diſeaſe in a greater degree, are confined ſomewhat longer; and, if there be the leaſt diſpoſition to coſtiveneſs, a very mild laxative is now and then exhibited; as the progreſs to maturation appears rather to be advanced than retarded by ſuch means.

When the maturation is completed, and there is nothing farther to fear from the diſtemper, Baron Dimſdale allows his patients gradually to change their courſe of diet, from the perfectly cooling kind, to one a little more generous; recommending ſtrictly to all a return to their ordinary animal-diet, with much caution and reſtraint upon their appetites, both in reſpect of food and fermented liquors.

He obſerves it is not often that we are under the neceſſity of making any application to the part where the inſertion of the variolous matter was made. It moſt commonly heals up, and is covered with a ſcab, about the time when, in a natural way, all the ſmall-pox would have been dried up. But in ſome caſes the inciſions continue to diſcharge a purulent matter a longer time. In theſe inſtances it is ſufficient to cover the part with the white cerate, or any other mild emplaſtic ſubſtance, which may at once prevent the linen from adhering to the ſore, and defend it from the air. As in theſe caſes the part remains unhealed from ſome peculiar cauſe in the habit, it will be neceſſary to give gentle purgatives, and proper alteratives, as particular exigencies may require.

After deſcribing the uſual progreſs of the ſmall-pox from inoculation, Baron Dimſdale remarks that there are frequent deviations from this courſe, which may embarraſs an unexperienced practitioner, and create a real difficulty, as well as apprehenſions of danger. He therefore proceeds to relate the means for removing thoſe ſymptoms, and the doubts reſpecting the event.

The ſymptom he firſt notices, and which, though it very rarely happens, ſometimes gives much trouble, is great ſickneſs, accompanied with vomiting, in the eruptive ſtate of the diſeaſe. For this complaint it is always neceſſary in the firſt place to clear the ſtomach; which may be effected, either by ordering the patient to drink plentifully of warm liquids to promote vomiting; or perhaps more properly, by giving to an adult one grain of tartariſed antimony, mixed with ten grains of compound powder of crab's-claws; taking care to diminiſh the doſe for very young and weak ſubjects.

This uſually throws off ſome bilious matter by vomit, ſometimes procures ſtools, or occaſions a moderate ſweat, and generally adminiſters relief. If, however, no ſtools ſhould follow from this medicine, and the ſickneſs ſhould remain, a gentle laxative almoſt certainly procures a reſpite, and the appearence of the eruption entirely removes the complaint.

Another deviation, of yet greater conſequence, which ſometimes happens towards the times of the eruption, and is often, though not always, accompanied with great ſickneſs, is an eryſipelatous efflореſcence. If this ſhows itſelf on the ſkin partially, and here and there in patches, it is not very alarming, and ſoon wears off. But ſometimes the whole ſurface of the body is covered with a raſh intimately mixed with the variolous eruption, and ſo much reſembling the moſt malignant kind of confluent ſmall-pox as ſcarcely to be diſtinguiſhed from it. In ſome ſuch caſes, accompanied with petechiæ and livid ſpots, Baron Dimſdale has been much alarmed; not being able by inſpection only, though aſſiſted by glaſſes, to determine whether what he ſaw was an inoffenſive raſh, or tokens of the greateſt malignity. Very ſtrict attention, however, has enabled him to diſtinguiſh the difference clearly; and for aſſiſting others in ſuch a diſcrimination, he makes the following remarks.

The real and eſſential difference is to be gathered from the concomitant ſymptoms. In the eryſipetalous or variolous raſh, there is not ſo much fever, nor is the reſtleſsneſs or pain of the head or loins ſo conſiderable neither is there that general proſtration of ſtrenth; all which are uſual attendants on a confluent ſmall-pox eſpecially when accompanied with ſuch putrid appearances. Beſides. upon a careful examination, there may ſometimes be diſcerned a few diſtinct puſtules, larger than the reſt, mixed with the raſh, which are the real ſmall-pox. In theſe caſes the patients are ordered to refrain from cold water, or any thing cold and to keep within doors, but not in bed. If any ſickneſs yet remains, a little white-wine whey, or other temperate cordial, is adviſed; and this method has been ſo generally ſucceſsful, as to prevent any alarming complaint. After two or three days, the ſkin changes from a florid to a duſky colour, a few diſtinct puſtules remain and advance properly to maturation without any farther trouble enſuing from this formidable appearance.

This raſh has often been miſtaken for the confluence it ſo much reſembles; and has afforded occaſion for ſome practitioners, either ignorantly or diſingenouſly, to pretend, that, after a very copious eruption of the confluent pox, they can by a ſpecific medicine, diſcharge the greater part of the puſtules. leaving only as many diſtinct ones as may ſatiſfy the patient that he has the diſeaſe.

Baron Dimſdale informs us, that raſhes of the kind above deſcribed frequently happen during the preparation (whether owing to the regimen, or medicine, or both, he does not determine), and cauſe the operation to be poſtponed. But he has obſerved, that in ſuch caſes they are apt to return at the time of the eruption of the ſmall pox.

In general, as has been already ſaid, the ſymptoms which precede eruption commence at the end of the ſeventh or on the eighth day incluſive from the operation; but it often happens that they appear much ſooner, and ſometimes much later than this period. Baron Dimſdale has ſeen ſome caſes in which the diſeaſe has come on ſo ſuddenly after infection, and with ſo little complaint or uneaſineſs, that the whole affair has been terminated, purges taken and the patient returned home perfectly well, in a week; before others, inoculated at the ſame time, from the ſame patient, and under the ſame circumſtances, have begun to complain.

In this caſe, the inoculated part ſhows early certain marks of infection, ſometimes on the very next day, or the day after, when the inciſion will often appear conſiderably inflamed and elevated, The patient about this time frequently makes ſome of the following complaints, viz. chillneſs, itchings and ſlight pricking pains in the part, and ſometimes on the ſhoulder; giddineſs, drowſineſs, and a ſlight head-ach, ſometimes attended with a feveriſh heat, but often without any. The account which patients themſelves give of their feelings is, in ſome, as if they had drank too much, and in others, as if they had caught a cold. Thoſe complaints ſeldom laſt 24 hours, often not ſo long, and with frequent intermiſſions; never, ſo far as our author remembers, riſing to a degree that requires confinement. During the continuance of thoſe complaints, the inflammation of the arm advances apace, and feels hard to the touch: but upon their wearing off, the inflamed appearances gradually diminiſh, and the part dries to a common ſmall ſcab; the ſkin, that was before red, turns livid, and the diſeaſe entirely vaniſhes. In ſome inſtances, thoſe ſymptoms attack much later; even on the ſeventh or eighth day, when an eruption might be expected in conſequence of them, yet none appears; but the arm gets well very ſoon, and the diſeaſe is at an end.

In this irregular ſort of the diſorder there have, however, been ſome examples where a few eruptions have appeared, and probably in conſequence of the inocculation; yet the puſtules have not looked like the true ſmall-pox, neither have they maturated like them nor laſted longer than three days; about which time for the moſt part, they have dried away.

When this irregular kind of the diſeaſe firſt occurred in Baron Dimſdale's practice, he was in doubt whether the patients were quite ſecure from any future attacks of the diſtemper. In order to be ſatisfied of this point, he inoculated them a ſecond time, cauſing them to aſſociate with perſons in every ſtage of the diſeaſe, and to try all other means of catching the infection. This method has been practiſed with the generality of ſuch patients ever ſince, yet without a ſingle inſtance of its producing any diſorder. Baron Dimſdale, therefore, now makes no ſcruple of pronouncing them perfectly ſafe; and experience has enabled him to foretel, for the moſt part, in two or three days after the operation, whether the diſeaſe will paſs in this ſlight manner.

Upon the ſecond inoculation, however, the inciſed parts are commonly inflamed for a day or two, juſt in the ſame manner as has in numerous inſtances been obſerved, as well in thoſe who, though certain of having had the ſmall-pox in the natural way, have ſubmitted to inoculation for the ſake of experiment, as in others, who being doubtful whether they have had the diſeaſe or not, have been inoculated in order to be ſatisfied. But in all ſuch caſes, the parts ſoon became well; nor did any of thoſe appearances which have been deſcribed as the conſtant attendants on inoculation, as pain in the head, giddineſs, marks of infection, in the arm, &c. enſue. Neither can thoſe appearances ever be produced upon a perſon who has had the ſmall-pox before, either in the natural way or by inoculation.

Another irregularity deſerving notice is, that ſometimes upon the abatement of the fever and other ſymptoms, after the appearance of ſeveral puſtules, and when the eruptive ſtage of the diſeaſe ſeems completed, it neverthleſs happens that freſh eruptions come out, and continue doing ſo daily, for four, five, or even ſix days ſucceſſively; preceded ſometimes by a ſlight pain in the head, though more frequently they appear without any new diſturbence. Thoſe are generally few, of ſhort duration, and ſeldom come to maturity. Baron Dimſdale, however, has ſeen four caſes in which, after a ceſſation of complaints, and an appearance of few puſtules, the eruptive ſtage of the diſeaſe was thought to be over, yet in two or three days

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a freſh fit of fever has attacked the patients, and after a ſhort illneſs a quantity of new puſtules has broke out far exceeding the firſt number, and thoſe remained and matured completely,

Some of the Baron's own patients, and, as he has been credibly informed, thoſe of other inoculators, have had conſiderable eruptions of this kind after they returned home; which have probably given occaſion for the reports of ſeveral having had the diſeaſe in the natural way after inoculation. But in confirmation that thoſe reports are ill-grounded, he obſerves, that in all the caſes of this ſort which have occurred in his own practice, or as far as he can learn, in that of others, the ſecond or latter crop of puſtules has always happened within the time uſually allowed for the progreſs of the ſmall-pox from inoculation; before the inflammation on the arm has ceaſed, and ſooner than we can ſuppoſe them to have been produced by infection received in the natural way. When this has happened, it has been to perſons in whom, after a ſlight eruption and abatement of ſymptoms, the diſeaſe has prematurely been judged to be quite over, and they have therefore been permitted to return to their families.

An appearance, more alarming and more dangerous than any of thoſe which have already been taken notice of, is the occurrence of epileptic fits. For although it has been remarked, that theſe are often the forerunners of a mild diſeaſe, both in caſes of accidental and likewiſe of intentional contagion; yet it is undeniable, that in not a few inſtances they have of themſelves proved fatal. Wherever, therefore, an epileptic fit occurs, it naturally claims the attention of the practitioner. The occurence of future fits is beſt prevented by the employment of tincture of opium, taking off the tendency to inordinate action by giving at leaſt a temporary diminution of irritability; and on the ſame principle, when during a fit the patient is able to ſwallow, nothing is more effectual either in ſhortening the fit or diminiſhing its ſeverity, then a doſe of laudanum accommodated to the age and condition of the patient. Conſiderable benefit may be deprived from any volatile alkaline ſpirit, ſuch as ſpirit of hartſhorn, the favourite remedy of Dr Sydenham in ſuch caſes. But the beſt effects may be obtained from the uſe of the tepid bath, which is not only of ſervice in ſuch caſes from its action as an antiſpaſmodic, but which alſo, by producing relaxation of the ſkin facilitates and promotes the eruption. And even allowing that, as ſome imagine, the number of puſtules ſhould be increaſed by heat applied in this manner; yet much leſs is to be dreaded from thence than from the continuance of the fits.

Baron Dimſdale next conſiders the conſequences that ariſe from this very cool and repelling method and how far the patients future ſtate of health may be affected by a practice ſo oppoſite to what was formerly employed.

It has been the general opinion, that in moſt or all eruptive complaints, eſpecially the ſmall-pox, the rational method of cure was to forward; by every gentle means, the efforts of nature in producing an eruption and on the contrary, that there was danger in checking it, either by cold air, cold drink, or any conſiderable evacuations. For this purpoſe the uſe of warm diluents, and the lying in bed, eſpecially if the fever and ſymptoms run high, or at leaſt confining to the houſe, have been generally approved and recommended. Experience, however, has now ſufficiently confirmed the advantage of a different kind of treatment.

While the old methods prevailed of conducting inoculation, the patients, particularly children, after paſſing through the diſeaſe in a very favourable manner, were frequently liable to abſceſſes in the axilla and other parts, tedious ophthalmies, and troubleſome ulcerations in the place of inſertion; which though they could not be foreſeen nor prevented, yet often gave more pain and vexation to the patients, and trouble to the operator, than the diſeaſe itſelf had done. But on inquiry into the ſtate of thoſe who have been treated in the cool way, or according to the new method, Baron Dimſdale affirms, that in more than 1500 there has been only one who has had ſo much as a boil in the axilla; and this was a child who had in the ſame arm an iſſue, which was at that time dried up. He has ſeen only two very ſmall ſuperficial boils in others near the place of inſertion: and thoſe ſeemed to be occaſioned rather by an irritation from the diſcharge than by any other cauſe, and were all ſoon healed with very little trouble.

In a few inſtances alſo, there has been a ſlough in the inciſed part, which has cauſed a ſore of ſhort duration; but not one inſtance of an ulcer of any continuance. Such like breakings out too, and ſcabs as frequently ſucceed the mild natural ſmall-pox, ſometimes though rarely happen to thoſe inoculated in the new way; and, as they are of little conſequence, are generally cured by the ſame method, the uſe of a few gentle purges.

In regard to ophthalmies from this kind of practice, Baron Dimſdale has never known an inſtance of one truly deſerving that name. The coats of the eye have been a little inflamed in a very few, but they ſoon became clear, without any means uſed for that purpoſe. He knows but two caſes where he thought the inflammation great enough to require bleeding; and not one where a bliſter was neceſſary. Thoſe complaints, therefore, which were formerly ſo frequent and troubleſome, ſeem to be much reduced by the new method, the great utility of which is now univerſally acknowledged.

When the benefits of inoculation have now been demonſtrated to be ſo great, it is truly ſurpriſing that the practice has not yet become general. Even its wonderful ſucceſs, however, particularly when contraſted with the natural ſmall-pox, has not been ſufficient to remove every prejudice againſt it; and in many parts of Britain, the lower claſs are deterred from it by ſcruples even of a religious nature, by which means the ſtate annually ſuſtains a very conſiderable loſs. It is, however, but juſt to obſerve, that in many parts, both the medical practitioners and the clergy have done all in their power to remove every difficulty. At Edinburgh, the colleges of phyſicians and ſurgeons annually make an offer of their aſſiſtance and advice *gratis* to all the poor who ſubmit to this operation during certain months; and a moſt reſpectable clergyman has been at the expence of publiſhing a plain and ſenſible diſcourſe, not only calculated to remove every religious doubt or ſcruple which can be entertained on

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this head, but alſo clearly demonſtrating to parents that they have themſelves to blame for the death of their children if they neglect to employ the means with which Providence has furniſhed them for preſerving the lives of their offſpring.

226 GENUS XXIX. VARICELLA.

CHICKEN-POX.

Varicella, *Vog.* 42.
Variola lymphatica, *Sauv.* ſp. 1.
Anglis, *The* CHICKEN-POX, Edin. Med. Eſſays, vol. ii. art. 2. near the end. *Heberden*, Med. Tranſac. art. 17.

This is in general a very ſlight diſeaſe; and is attended with ſo little danger, that it would not merit any notice, if it were not apt to be confounded with the ſmall-pox, and thus give occaſion to an opinion that a perſon might have the ſmall-pox, twice in his life; or they are apt to deceive into a falſe ſecurity thoſe who have never had the ſmall-pox, and make them believe that they are ſafe when in reality they are not. This eruption breaks out in many, according to Dr Heberden, without any illneſs or previous ſign; in others it is preceded by a little degree of chillneſs, laſſitude, cough, broken ſleep, wandering pains, loſs of appetite, and feveriſh ſtate for three days.

In ſome patients the chicken-pox make their firſt appearance on the back; but this perhaps is not conſtant. Moſt of them are of the common ſize of the ſmall-pox, but ſome are leſs. Dr Heberden never ſaw them confluent, nor very numerous. The greateſt number was about 12 in the face, and 200 over the reſt of the body.

On the firſt day of the eruption they are reddiſh. On the ſecond day there is at the top of moſt of them a very ſmall bladder, about the ſize of a millet-ſeed. This is ſometimes full of a watery and colourleſs, ſometimes of a yellowiſh liquor contained between the cuticle and ſkin. On the ſecond, or at the fartheſt, on the third day from the beginning of the eruption, as many of theſe pocks as are not broken ſeem arrived at their full maturity; and thoſe which are fulleſt of that yellow liquor very much reſemble what the genuine ſmall-pox are on the fifth or ſixth day, eſpecially where there happens to be a larger ſpace than ordinary occupied by the extravaſated ſerum. It happens to moſt of them, either on the firſt day that this little bladder ariſes, or on the day after, that its tender cuticle is burſt by the accidental rubbing of the clothes, or by the patien's hands to allay the itching which attends this eruption. A thin ſcab is then formed at the top of the pock, and the ſwelling of the other part abates, without its ever being turned into pus, as it is in the ſmall-pox. Some few eſcape being burſt; and the little drop of liquor contained in the veſicle at the top of them, grows yellow and thick, and dries into a ſcab. On the fifth day of the eruption they are almoſt all dried and covered with a ſlight cruſt. The inflammation of theſe pocks is very ſmall, and the contents of them do not ſeem to be owing to ſuppuration, as in the ſmall-pox, but rather to what is extravaſated under the cuticle by the ſerous veſſels of the ſkin, as in a common bliſter. No wonder, therefore, that this liquor appears ſo ſoon as on the ſecond day; and that, upon the cuticle being broken, it is preſently ſucceeded by a ſlight ſcab: hence too as the true ſkin is ſo little affected, no mark or ſcar is likely to be left, unleſs in one or two pocks, where, either by being accidentally much fretted, or by ſome extraordinary ſharpneſs of the contents, a little ulcer is formed in the ſkin.

Varicella.

The patients ſcarce ſuffer any thing throughout the whole progreſs of this illneſs, except ſome languidneſs of ſtrength and ſpirits and appetite; all which is probably owing to the confining of themſelves to their chamber.

Two children were taken ill of the chicken-pox, whoſe mother choſe to be with them, though ſhe had never had this illneſs. Upon the eighth or ninth day after the pocks were at their height in the children, the mother fell ill of this diſtemper then beginning to ſhow itſelf. In this inſtance the infection lay in the body much about the ſame time that it is known to do in the ſmall-pox

Remedies are not likely to be much wanted in a diſeaſe attended with hardly any inconvenience, and which in ſo ſhort a time is certainly cured of itſelf.

The principal marks by which the chicken-pox may be diſtinguiſhed from the ſmall pox are,

1. The appearance, on the ſecond or third day from the eruption, of that veſicle full of ſerum upon the top of the pock.

2. The cruſt, which covers the pocks on the fifth day; at which time thoſe of the ſmall-pox are not at the height of their ſuppuration.

Foreign medical writers hardly ever mention the name of this diſtemper; and the writers of Great Britain ſcarce mention any thing more of it than its name. Morton ſpeaks of it as if he ſuppoſed it to be a very mild genuine ſmall-pox. But theſe two diſtempears are ſurely totally different from one another, not only on account of their different appearances abovementioned, but becauſe thoſe who have had the ſmall-pox are capable of being infected with the chicken-pox; but thoſe who have once had the chicken-pox are not capable of having it again, though to ſuch as have never had this diſtemper, it ſeems as infectious as the ſmall-pox. Dr Heberden wetted a thread in the moſt concocted pus-like liquor of the chicken-pox which he could find; and after making a ſlight inciſion, it was confined upon the arm of one who had formerly had it; the little wound healed up immediately, and ſhowed no ſigns of any infection.

From the great ſimilitude between the two diſtempers, it is probable, that inſtead of the ſmall-pox, ſome perſons have been inoculated from the chicken-pox; and that the diſtemper which has ſucceeded, has been miſtaken for the ſmall-pox by haſty or unexperienced obſervers.

There is ſometimes ſeen an eruption, concerning which Dr Heberden is in doubt whether is to be one of the many unnoticed cutaneous diſeaſes, or only a more malignant ſort of chicken-pox.

This diſorder is preceded for three or four days by all the ſymptoms which forerun the chicken-pox; but in a much higher degree. On the fourth or fifth day the erruption apears, with very little abatement of the fever: the pains likewiſe of the limbs and back ſtill continue, to which are joined pains of the gums. The pocks are redder than the chicken-pox, and ſpread wider; and hardly riſe ſo high, at leaſt not in proportion to their ſize. Inſtead of one little head or veſicle of a ſerous matter, theſe have from four to ten or twelve. They go off juſt like the chicken-pox, and are diſtinguiſhable from the the ſmall-pox by the ſame marks; beſides which, the continuance of the pains and fever after the eruption, and the degree of both theſe, though there be not above 20 pocks, are circumſtances never happening in the ſmall-pox.

227 GENUS XXX. RUBEOLA
MEASLES.

Rubeola, *Sauv.* gen. 94. *Lin.* 4. *Sag.* 293.
Febris morbilloſa, *Vog.* 36. *Hoffm.* II. 62.
Morbilli, *Junck.* 76.

Sp. I. The *Regular* MEASLES.

Rubeola vulgaris, *Sauv.* ſp. 1.
Morbilli regulares, *Sydenh.* ſect. iv. cap. v.

Var. 1. The *Anomalous* MEASLES.

Rubeola anomala, *Sauv.* ſp. 2.
Morbilli anomali, *Sydenh.* ſect. v. cap. 3.

Var. 2. The MEASLES attended wih *Quinſy*.

Var. 3. The MEASLES with *Putrid Diatheſis* of the Blood.

228 Sp. II. The VARIOLODES.

In Scotland commonly called the *Nirles*.

Rubeola variolodes, *Sauv.* ſp. 3.

Deſcription. This diſeaſe begins with a cold ſtage, which is ſoon followed by a hot, with the ordinary ſymptoms of thirſt, anorexia, anxiety, ſickneſs, and vomiting; and theſe are more or leſs conſiderable in different caſes. Sometimes from the beginning the fever is ſharp and violent: often, for the firſt two days, it is obſcure and inconſiderable; but always becomes violent before the eruption, which commonly happens on the fourth day. This eruptive fever, from the beginning of it, is always attended with hoarſeneſs, a frequent hoarſe dry cough, and often with ſome difficulty of breathing. At the ſame time, the eye-lids are ſomewhat ſwelled; the eyes are a little inflamed, and pour out tears; and with this there is a coryza, and frequent ſneezing. For the moſt part, a conſtant drowſineſs attends the beginning of the diſeaſe. The eruption, as we have ſaid, commonly appears upon the fourth day, firſt on the face, and ſucceſſively on the lower parts of the body. It appears firſt in ſmall red points; but, ſoon after, a number of theſe appear in cluſters, which do not ariſe in viſible pimples, but, by the touch, are found to be a little prominent. This is the caſe on the face; but, in other parts of the body, the prominency, or roughneſs, is hardly to be perceived. On the face, the eruption retains its redneſs, or has it increaſed for two days; but on the third, the vivid redneſs is changed to a browniſh red; and in a day or two more the eruption entirely diſappears, while a mealy deſquamation takes place. During the whole time of the eruption, the face is ſomewhat turgid, but ſeldom conſiderably ſwelled. Sometimes, after the eruption has appeared, the fever ceaſes entirely: but this is ſeldom the caſe; and more commonly the fever continues or is increaſed after the eruption, and does not ceaſe till after the deſquamation. Even then the fever does not always ceaſe, but continues with various duration and effect. Though the fever happen to ceaſe upon the eruption's taking place, it is common for the cough to continue till after the deſquamation, and ſometimes much longer. In all caſes, while the fever continues, the cough alſo continues, generally with an increaſe of the difficulty of breathing; and both of theſe ſymptoms ſometimes ariſe to a degree which denote a pneumonic affection. This may happen at any period of the diſeaſe; but very often it does not come on till after the deſquamation of the eruption.

After the ſame period, alſo, a diarrhœa frequently comes on, and continues for ſome time.

It is common for meaſles, even when they have not been of a violent kind, to be followed by inflammatory affections, particularly ophthalmia and phthiſis. If blood be drawn from a vein in the meaſles, with circumſtances neceſſary to favour the ſeparation of the gluten, this always appears ſeparated, and lying on the ſurface of the craſſamentum, as in inflammatory diſeaſes. For the moſt part, the meaſles, even when violent, are without any putrid tendency; but in ſome caſes, ſuch a tendency appears both in the courſe of the diſeaſe, and eſpecially after the ordinary courſe of it is finiſhed.

Cauſes. The meaſles are occaſioned by a peculiar kind of contagion, the nature of which is not underſtood; and which, like that of the ſmall-pox, affects a perſon only once in his life.

Prognoſis. From the deſcription of this diſtemper already given, it appears that the meaſles are attended with a catarrhal affection, and with an inflammatory diatheſis to a conſiderable degree; and therefore the danger of them is to be apprehended chiefly from the coming on of a pneumonic inflammation.

Cure. In meaſles, as well as in ſmall-pox, the diſeaſe from its nature muſt neceſſarily run a determined courſe; and therefore the ſole aim of a practitioner is to conduct this courſe in the eaſieſt manner, by preventing and obviating urgent ſymptoms.

From the conſideration mentioned in the prognoſis, it will be obvious, that the remedies eſpecially neceſſary are thoſe which may obviate and diminiſh the inflammatory diatheſis; and therefore, in a particular manner, blood-letting. This remedy may be employed at any time in the courſe of the diſeaſe, or after the ordinary courſe of it is finiſhed. It is to be employed more or leſs, according to the urgency of the ſymptoms of fever, cough, and dyſpnœa; and generally may be employed very freely. But as the ſymptoms of a pneumonic inflammation ſeldom come on duthe eruptive fever, and as this is ſometimes violent immediately before the eruption, though a ſufficiently mild diſeaſe be to follow; bleeding is ſeldom very neceſſary during the eruptive fever, and may often be reſerved for the times of greater danger which are perhaps to follow.

In all caſes of meaſles, where there are no marks of putreſcency, and where there is no reaſon, from the known nature of the epidemic, to apprehend putreſcency, bleeding is the remedy moſt to be depended upon:.

upon: but aſſiſtance may alſo be drawn from cooling purgatives; and particularly from bliſtering on the ſides or between the ſhoulders. The dry cough may be alleviated by the large uſe of demulcent pectorals, mucilaginous, oily, or ſweet. It may, however, be obſerved with reſpect to theſe demulcents, that they are not ſo powerful in involving and correcting the acrimony of the maſs of blood as has been imagined; and that their chief operation is by beſmearing the fauces, and thereby defending them from the irritation of acrids, either ariſing from the lungs or diſtilling from the head. For moderating and quieting the cough in this diſeaſe, opiates certainly prove the moſt effectual means, whenever they can be ſafely employed. In the meaſles, in which an inflammatory ſtate prevails in a conſiderable degree, opiates have indeed by ſome been ſuppoſed to be inadmiſſible: but experience abundantly demonſtrates, that the objection made to their uſe is merely hypothetical; and even in caſes where, from a high degree of pyrexia and of dyſpnœa, there is reaſon to fear the preſence, or at leaſt the danger, of pneumonic inflammation, opiates are highly uſeful; after bleeding, to obviate or abate the inflammatory ſtate, has been duly employed: in ſuch caſes, while the cough and watchfulneſs are the urgent ſymptoms, opiates may be ſafely exhibited, and with great advantage. In all the exanthemata, there is an acrimony diffuſed over the ſyſtem, which gives a conſiderable irritation; and, for obviating the effects of this, opiates are uſeful, and always proper, when no particular contra-indication prevails.

When the deſquamation of the meaſles is finiſhed, though then there ſhould be no diſorder remaining, phyſicans have thought it neceſſary to purge the patient ſeveral times, with a view to draw off what have been called the *dregs of this diſeaſe;* that is, a portion of the morbific matter which is ſuppoſed to remain long in the body. Dr Cullen does not reject this ſuppoſition; but at the ſame time cannot believe that the remains of the morbific matter diffuſed over the whole maſs of blood, can be wholly drawn off by purging; and therefore thinks, that, to avoid the conſequence of the meaſles, it is not the drawing off the morbific matter which we need to ſtudy, ſo much as to obviate and remove the inflammatory ſtate of the ſyſtem which had been induced by the diſeaſe. With this laſt view indeed, purging may ſtill be a proper remedy; but bleeding, in proportion to the ſymptoms of inflammatory diſpoſition is ſtill more ſo.

From our late experience of the uſe of cold air in the eruptive fever of the ſmall-pox, ſome phyſicians have been of opinion that the practice may be transferred to the meaſles; but this point has not yet been determined by ſufficiently extenſive experience. We are certain, that external heat may be very hurtful in the meaſles, as in moſt other inflammatory diſeaſes; and therefore, that the body ought to be kept in a moderate temperature during the whole courſe of the diſeaſe: but how far, at any period of the diſeaſe, cold air may be applied with ſafety, is ſtill uncertain. Analogy, though ſo often the reſource of phyſicians, is frequently fallacious; and further, though the analogy with the ſmall-pox might lead to the application of cold air during the eruptive fever of the meaſles, the anaolgy with catarrh ſeems to be againſt the practice. When the eruption is upon the ſkin, there are many inſtances of cold air making it diſappear, and thereby producing much diſorder in the ſyſtem; and there are alſo frequent inſtances of this diſorder's being removed by reſtoring the heat of the body, and thereby again bringing out the eruption.

Upwards of 20 years ago, inoculation for the meaſles was propoſed, and practiſed in ſeveral inſtances with ſucceſs, by Dr Home of Edinburgh. His method of communicating the infection was, by applying to an inciſion in each arm cotton moiſtened with the blood of a patient labouring under the meaſles; but with others who have made ſimilar trials, the attempt has not yet ſucceeded. And attempts have been made to inoculate this diſeaſe by means of the fluid diſcharged under the form of tears, the ſquamæ falling from the ſurface, and the like; but there is reaſon to believe, that where it was imagined the infection had thus been communicated, the contagion was only carried about the perſon inoculating, and communicated in the ordinary way.

From inoculation of the meaſles, it is imagined that ſeveral advantages may be obtained, and among others, it is thought the ſoreneſs of the eyes may be mitigated, the cough abated, and the fever rendered leſs ſevere. But the practice was never much in faſhion, and now is ſcarce ever heard of.

GENUS XXXI. MILIARIA. 229

The MILIARY FEVER.

Miliaria, *Lin.* 7.
Miliaris, *Sauv.* gen. 95. *Sag.* gen. 295.
Febris miliaris, *Vog.* 37.
Febris purpurata rubra et alba miliaris, *Hoffm.* II. 68.
Febris purpurea ſeu miliaris, *Junk.* 75.
Germanis der Frieſel. *God. Welſch*, Hiſt. Med. de novo puerperarum morbo, qui der *Frieſel* dicitur, Lipſ. 1655.
Hamilton, de febr. miliar. 1710. *Fantonus*, de febr. mil. 1747. *Allioni* de miliar. 1758. *Fordyce*, de febr. mil. 1748. *Fiſcher*, de febr. mil. 1767. *De Haen*, de diviſ. febr. 1760, et in Ration. med. paſſim. *Mat. Collin* ad Baldinger de miliar. 1764.
Miliaris benigna, *Sauv.* ſp. 1.
Miliaris maligna, *Sauv.* ſp. 2.
Miliaris recidivans, *Sauv.* ſp. 3.
Miliaris Germanica, *Sauv.* ſp. 5.
Miliaris Boia, *Sauv.* ſp. *a.*
Miliaris Britannica, *Sauv.* ſp. *i.*
Miliaris nova febris, *Sydenh.* Sched. monit. *Sauv.* ſp. *d.*
Miliaris ſudatoria, *Sauv.* ſp. *e.*
Miliaris nautica, *Sauv.* ſp. *g.*
Miliaris purpurata, *Sauv.* ſp. *h.*
Miliaris lactea, *Sauv.* ſp. *c.*
Miliaris puerperarum, *Sauv.* ſp. *k.*
Miliaris ſcorbutica, *Sauv.* ſp. *l.*
Miliaris critica, *Sauv.* ſp. *b.*

Hiſtory and Deſcription. This diſeaſe is ſaid to have been unknown to the ancients, and that it appeared for the firſt time in Saxony about the middle of the laſt century. It is ſaid to have ſince ſpread from thence into all the other countries of Europe; and, ſince the period mentioned, to have appeared in many countries in which it had never appeared before.

From the time of its having been firſt taken notice of, it has been deſcribed and treated of by many different writers; and by all of them, till very lately, has been conſidered as a peculiar idiopathic diſeaſe. It is ſaid to have been conſtantly attended with peculiar ſymptoms. It comes on with a cold ſtage, which is often conſiderable. The hot ſtage, which follows, is attended with great anxiety, and frequent ſighing. The heat of the body becomes great, and ſoon produces profuſe ſweating, preceded, however, with a ſenſe of pricking, as of pin points in the ſkin; and the ſweat is of a peculiar rank and diſagreeable odour, The eruption appears ſooner or later in different perſons, but at no determined period of the diſeaſe. It ſeldom or never appears upon the face; but appears firſt upon the neck and breaſt, and from thence often ſpreads over the whole body.

The eruption named *miliary* is ſaid to be of two kinds; the one named the *red*, the other the *white miliary*. The former, which in Engliſh is ſtrictly named a *raſh*, is commonly allowed to be a ſymptomatic affection; and as the latter it is the only one that has any pretenſions to be conſidered as an idiopathic diſeaſe, it is this only that we ſhall more particularly deſcribe and treat of under this genus.

What is then called the *white miliary eruption*, appears at firſt like the red, in very ſmall red pimples for the moſt part diſtinct, but ſometimes cluſtered together. Their little prominence is better diſtinguiſhed by the finger than by the eye. Soon after the appearance of this eruption, and, at leaſt, on the ſecond day, a ſmall veſicle appears upon the top of the pimples. At firſt the veſicle is whey-coloured; but ſoon becomes white, and ſtands out like a little globule on the top of the pimple. In two or three days thoſe gloubules break, or are rubbed off; and are ſucceeded by ſmall cruſts, which ſoon after fall off in ſmall ſcales. While one ſet of pimples take this courſe, another ſet ariſe to run the ſame; ſo that the diſeaſe often continues upon the ſkin for many days together. Sometimes when one crop of this eruption has diſappeared, another, after ſome interval, is produced. And it has been further obſerved, that in ſome perſons there is ſuch a diſpoſition to this diſeaſe, that they have been affected with it ſeveral times in the courſe of their lives.

This diſeaſe is ſaid to affect both ſexes, and perſons of all ages and conſtitutions; but it has been obſerved at all times to affect eſpecially, and moſt frequently, lying-in women.

It is often accompanied with violent ſymptoms and has frequently proved fatal. The ſymptoms, however attending it are very various; and they are, upon occaſions, every one attending febrile diſeaſes; but no ſymptom, or concourſe of ſymptoms, are ſteadily the ſame in different perſons, ſo as to give any ſpecific character to the diſeaſe. When the diſeaſe is violent, the moſt common ſymptoms are phrenetic comatoſe, and convulſive affections which are alſo ſymptoms of all fevers treated by a very warm regimen.

While there is ſuch a variety of ſymptoms appearing in this diſeaſe, it is not to be expected that any one particular method of cure can be propoſed; and, accordingly, we find in diffrent writers different methods and remedies preſcribed; frequent diſputes about the moſt proper; and thoſe received and practiſed by ſome, oppoſed and deſerted by others.

It appears, however, to Dr Cullen, very improbable, that this was really a new diſeaſe, when it was firſt conſidered as ſuch. There are very clear traces of it in authors who wrote long before that period; and though there were not, we know that ancient deſcriptions were often inaccurate and imperfect, particularly with reſpect to cutaneous affections; and we know alſo that thoſe affections which commonly appeared as ſymptomatic only, were often neglected, or confounded together under a general appellation.

The antecedent ſymptoms of anxiety, ſighing, and pricking of the ſkin, which have been ſpoken of as peculiar to this diſeaſe, are, however, common to many others; and perhaps to all thoſe in which ſweatings are forced out by a warm regimen. Of the ſymptoms ſaid to be concomitant of this eruption, there are none which can be affirmed to be conſtant and peculiar but that of ſweating. This, indeed, always precedes and accompanies the eruption; and, while the miliary eruption attends many different diſeaſes, it never, however, appears in any of theſe but after ſweating; and in perſons labouring under the ſame diſeaſes it does not appear, if in ſuch perſons ſweating be avoided. It is therefore probable, that the eruption is the effect of ſweating: and that it is the effect of a matter not before prevailing in the maſs of blood, but generated under particular circumſtances in the ſkin itſelf. That it depends upon particular circumſtances of the ſkin, is alſo probable from its being obſerved that the eruption ſeldom or never appears upon the face, although it affects the whole of the body beſides; and that it comes upon thoſe places eſpecially which are more cloſely covered; and that it can be brought out upon particular places by external applications.

It is to be obſerved, that this eruptive diſeaſe differs from the other exanthemata in many circumſtances, eſpecially the following; that it is not contagious, and therefore never epidemic; that the eruption appears at no determined period of the diſeaſe; that the eruption has no determined duration; that ſucceſſive eruptions frequently appear in the courſe of the ſame fever, and that ſuch eruptions frequently recur in the courſe of the ſame perſon's life. All this renders it very probable, that, in the miliary fever, the morbific matter is not a ſubſiſting contagion communicated to the blood, and thence, in conſequence of fever and aſſimilation, thrown out upon the ſurface of the body, but a matter occaſionally produced in the ſkin itſelf by ſweating.

This concluſion is further rendered probable from hence, that, while the miliary eruption has no ſymptoms or concourſe of ſymptoms peculiar to itſelf, it, upon occaſions, accompanies almoſt every febrile diſeaſe, whether inflammatory or putrid, if theſe happen to be attended with ſweating; and from thence it may be preſumed, that the miliary eruption is a ſymptomatic affection only, produced in the manner we have ſaid.

But as this ſymptomatic affection does not always accompany every inſtance of ſweating, it may be proper to inquire, what are the circumſtances which eſpecially

cially determine this eruption to appear? And to this Dr Cullen gives no full and proper anſwer. He cannot ſay that there is any one circumſtance which in all caſes gives occaſion to this eruption; nor can he ſay what different cauſes, in different caſes, may give occaſion to it. There is only one obſervation that can be made to the purpoſe of this inquiry; and it is, that theſe perſons ſweating, under febrile diſeaſes are eſpecially liable to the miliary eruption, who have been previouſly weakened by large evacuations, particularly of blood. This will explain why it happens to lying-in women more frequently than to any other perſons; and to confirm this explanation, he has obſerved, that the eruption has happened to other women though not in child-bed, but who had been much ſubjected to a frequent and copious menſtruation, and to an almoſt conſtant *fluor albus*. He has alſo obſerved it to have happened to men in fevers, after wounds from which they had ſuffered a great loſs of blood.

Further, that this eruption is produced by a certain ſtate of debility, is, he thinks, probable, from its ſo often attending fevers of the putrid kind, which are always atttended with great debility. It is true, that it alſo ſometimes attends inflammatory diſeaſes, when it cannot be accounted for in the ſame manner; but he believes it may be obſerved, that it eſpecially attends thoſe inflammatory diſeaſes in which the ſweats have been long protracted, or frequently repeated, and which have thereby produced a debility, and perhaps a debilitating putrid diatheſis.

That, however, the miliary eruption is not neceſſarily or even generally connected with a certain ſtate of debility, is abundantly evident from its being entirely wanting in by much the greater number of inſtances of typhoid fever, and in a variety of other diſeaſes where every poſſible degree of debility occurs: And that it is not connected with any certain ſtate of debility, ſtill farther appears, both from the condition of thoſe affected with it in different inſtances, which in point of ſtrength is very various; and likewiſe from the continuance of freſh eruptions with the ſame individual, although during that time in very different ſtates with reſpect to debility. It appears, therefore, much more probable, that it depends on ſome peculiar ſtate of the ſurface, induced by the concurring influence of certain prediſpoſing and occaſional cauſes.

It appears ſo clearly that this eruption is always a ſymptomatic and factitious affection that Dr Cullen is perſuaded it may be, in moſt caſes, prevented merely by avoiding ſweats. Spontaneous ſweatings, in the beginning of diſeaſes, are very rarely critical; and all ſweatings not evidenly critical, ſhould be prevented, or at leaſt moderated; and the promoting them, by increaſing external heat, is commonly very pernicious. Even critical ſweats ſhould hardly be encouraged by ſuch means. If, therefore, ſpontaneous ſweats ariſe, they are to be checked by the coolneſs of the chamber; by the lightneſs and looſeneſs of the bed-cloaths; by the perſons laying out their arms and hands; and by their taking cold drink: and in this way Dr Cullen thinks he has frequently prevented miliary eruptions, which were otherwiſe likely to have appeared, particularly in puerperal women.

But it may happen, when theſe precautions have been neglected, or from other circumſtances, that a miliary eruption does actually appear; and the queſtion will then be put, how the caſe is to be treated? This in a queſtion of conſequence; as there is reaſon to believe that the matter here generated is often of a virulent kind; it is often the offspring of putreſcency; and, when treated by increaſing the external heat of the body, it ſeems to acquire a virulence which produces thoſe ſymptoms mentioned above, and proves certainly fatal.

It has been an unhappy opinon with moſt phyſicians, that eruptive diſeaſes were ready to be hurt by cold; and that it was therefore neceſſary to cover up the body very cloſely, and thereby increaſe the external heat. We now know that this is a miſtaken opinion; that increaſing the external heat of the body is very generally miſchievous: and that ſeveral eruptions not only admit, but require the application of cold air. Dr Cullen is perſuaded, therefore, that the practice which formerly prevailed in the caſe of miliary eruptions, of covering up the body cloſely, and both by external means and internal remedies encouraging the ſweatings which accompany this eruption, was highly pernicious, and commonly fatal. He is therefore of opinion, that even when a miliary eruption has appeared, in all caſes in which the ſweating is not manifeſtly critical, we ſhould employ all the means of ſtopping the ſweating that are mentioned above; and he has ſometimes had occaſion to obſerve, that even the admiſſion of cool air was ſafe and uſeful.

This is, in general the treatment of miliary eruptions: but at the ſame time, the remedies ſuited to the primary diſeaſe are to be employed; and therefore, when the eruption happens to accompany inflammatory affections, and the fullneſs and hardneſs of the pulſe or other ſymptoms ſhow an inflammatory ſtate preſent, the caſe is to be treated by blood-letting, purging and other antiphlogiſtic remedies.

Upon the other hand, when the miliary eruption attends diſeaſes, in which debility and putreſcency prevail, it will be proper to avoid all evacuations, and to employ tonic and antiſeptic remedies, particularly the Peruvian bark, cold drink, and cold air.

The moſt diſtreſſing circumſtance attending this affection, is the almoſt unſupportable ſickneſs at ſtomach which frequently occurs, and which is often obſerved to precede freſh eruptions taking place during the courſe of the diſeaſe. With the view of counteracting and alleviating this ſymptom, recourſe is had to wine and other cordial medicines. But with many patients nothing is found to have ſo much influence as the uſe of camphor, particularly when introduced gradually in ſmall doſes, under the form of the *miſtura camphorata*, of the London Pharmacopeia, or the *emulſio camphorata* of that of Edinburgh.

We ſhall conclude this ſubject with obſerving, that the venerable octogenarian practitioner, de Fiſcher, when treating of this ſubject, in laying down the indications of cure, has given this as one of them: "Excretionis periphericæ non primariam habere rationem."

Genus XXXII. SCARLATINA. 230

Scarlet Fever.

Scarlatina, *Sauv.* gen. 98. *Vog.* 39. *Sag.* 294. *Junck.* 75.

Exanthemata

Sp. I. The Mild Scarlet Fever.

Scarlatina febris, *Sauv.* ſp. 1. *Sydenham*, ſect. vi. cap. 2.

Sp. II. The Scarlet Fever with *Ulcerated Sore Throat.*

Scarlatina anginoſa. *Withering* on the Scarlet Fever.

The mild ſcarlet fever is deſcribed by Sydenham, who tells us that he can ſcarce account it a diſeaſe; and indeed nothing more ſeems to be neceſſary in the treatment of it than an antiphlogiſtic regimen, avoiding the application of cold air and cold drink. The diſeaſe however ſometimes rages epidemically, and is attended with very alarming ſymptoms, bearing no ſmall reſemblance to the cynanche maligna, in which caſe it it is called *ſcarlatina anginoſa*.—The beſt deſcription of this diſtemper has been publiſhed by Dr Withering in the year 1778. This diſeaſe made its appearance, we are told, at Birmingham and the neighbouring villages, about the middle of May 1778. It continued in all its force and frequency to the end of October; varying, however, in ſome of its ſymptoms, as the air grew colder. In the beginning of November it was rarely met with; but towards the middle of that month, when the air became warmer, it increaſed again, and in ſome meaſure reſumed thoſe appearances it poſſeſſed in the ſummer-months, but which it had loſt during the cold winds in October.

It affected children more than adults; but ſeldom occurred in the former under two years of age, or in the latter if they had paſſed their fiftieth year.

Deſcription. With various general ſymptoms of fever, the patient at firſt complains of a dejection of ſpirits, a ſlight ſoreneſs or rather ſtiffneſs in the neck, with a ſenſe of ſtraitneſs in the muſcles of the neck and ſhoulders, as if they were bound with cords. The ſecond day of the fever this ſoreneſs of the throat increaſes, and the patients find a difficulty in ſwallowing; but the difficulty ſeems leſs occaſioned by the pain excited in the attempt, or by the ſtraitneſs of the paſſage, than by an inability to throw the neceſſary muſcles in action. The ſkin feels hot and dry, but not hard; and the patients experience frequent, ſmall, pungent pains, as if touched with the point of a needle. The breath is hot and burning to the lips, and thirſt makes them wiſh to drink; but the tendency to ſickneſs, and the exertions neceſſary in deglutition, are ſo unpleaſant, that they ſeldom care to drink much at a time. They have much uneaſineſs alſo from want of reſt during the night. In the morning of the third day, the face, neck, and breaſt, appear redder than uſual: in a few hours this redneſs becomes univerſal; and increaſes to ſuch a degree of intenſity, that the face, body, and limbs, reſemble a boiled lobſter in colour, and are evidently ſwollen. Upon preſſure the redneſs vaniſhes, but ſoon returns again. The ſkin is ſmooth to the touch, nor is there the leaſt appearance of pimples or puſtules. The eyes and noſtrils partake more or leſs of the general redneſs; and in proportion to the intenſity of this colour in the eyes, the tendency to delirium prevails.

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Things continue in nearly this ſtate for two or three days longer, when the intenſe ſcarlet gradually abates, a brown colour ſucceeds, and the ſkin becoming rough, peels off in ſmall ſcales. The tumefaction ſubſides at the ſame time, and the patients gradually recover their ſtrength and appetite.

During the whole courſe of the diſeaſe, the pulſe is quick, ſmall, and uncommonly feeble; the urine ſmall in quantity; the ſub-maxillary glands ſomewhat enlarged and painful to the touch. The velum pendulum palati, the uvula, the tonſils, and gullet, as far as the eye can reach, partake of the general redneſs and tumefaction; but although collections of thick mucus, greatly reſembling the ſpecks or ſloughs in the putrid ſore throat, ſometimes occur, yet thoſe are eaſily waſhed off, and real ulcerations of thoſe parts were never obſerved.

Theſe are the moſt uſual appearances of this diſorder; but it too frequently aſſumes a much more fatal form. In ſome children the delirium commences in a few hours after the firſt attack; the ſkin is intenſely hot; the ſcarlet colour appears on the firſt or ſecond day, and they die very early on the third. Others again, who ſurvive this rapid termination, inſtead of recovering, as is uſual, about the time the ſkin begins to get its natural colour, fall into a kind of lingering, and die at laſt in the courſe of ſix or eight weeks.

In adults, circular livid ſpots were frequently obſerved about the breaſt, knees, and elbows; alſo large blotches of red, and others of white intermixed, and often changing places.

In the month of October, when the air becomes colder, the ſcarlet colour of the ſkin was both leſs frequent and leſs permanent. Many patients had no appearance of it at all; whilſt others, eſpecially adults, had a few minute red pimples, crowned with white pellucid heads. The inſide of the throat was conſiderably tumefied; its colour a dull red, ſometimes tending to a livid. The pulſe beat in general 130 or 140 ſtrokes in a minute; was ſmall, but hard, and ſometimes ſufficiently ſo to juſtify the opening of a vein; and the blood thus taken away, in every inſtance when cool, appeared ſizy, and the whole craſſamentum firm.

Happy would it be, Dr Withering obſerves, if the baneful influence of this diſorder terminated with the febrile ſymptoms. But in ten or fifteen days from the ceſſation of the fever, and when a complete recovery might be expected, another train of ſymptoms occur, which at laſt frequently terminate fatally. The patients, after a few days amendment, feel a ſomething that prevents their farther approach to health; an unaccountable langour and debility prevails, a ſtiffneſs in the limbs, an accelerated pulſe, diſturbed ſleep, diſreliſh to food, and a ſcarcity of urine. Theſe ſymptoms, we are told, are ſoon ſucceeded by ſwellings of a real dropſical nature, forming ſometimes an anaſarca, and on other occaſions an aſcites; and not unfrequently ſcarlatina has proved fatal, from ſupervening hydrothorax in conſequence of the effuſion of water into the cheſt. It is unneceſſary to remark, that when this happens, a fatal termination is more ſudden than from any other modification of dropſy.

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Dr Withering, after examining the accounts given of this diſeaſe by different authors, proceeds to the diagnoſis. It may be diſtinguiſhed, he obſerves, from the petechial fever, by the eruption in the latter appearing ſeldom before the fourth day, by the regularity and diſtinctneſs of the ſpots, and by its principally occupying the neck, the back, and the loins. On the other hand, in the ſcarlet fever, the eruption generally appears about the third day; conſiſts either of broad blotches, or elſe one continued redneſs, which ſpreads over the face and the whole body.

In the fever called *purpura*, the puſtules are prominent, keep their colour under preſſure, and never appear early in the diſeaſe; whereas in the ſcarlet fever, the eruption appears more early, is not prominent, but perfectly ſmooth to the touch, and becomes quite white under preſſure.

Although the *purple fever* and *ſcarlatina* may be connected by ſome general cauſe, yet our author takes occaſion to obſerve, that they cannot be mere modifications of the ſame eruption: for examples occur, he ſays, of the ſame perſon being firſt ſeized with one of theſe diſorders, and afterwards with the other; but he never met with an inſtance of the ſame perſon having the ſcarlet fever twice; and he believes it to be as great an improbability as a repetition of the ſmall-pox.

This diſorder is particularly diſtinguiſhed from the *meaſles*, we are told, by the want of that cough, watery eye, and running at the noſe, which are known to be the predominant ſymptoms in the early ſtate of the meaſles, but are never known to exiſt in the ſcarlatina.

From the *eryſipelas* this diſeaſe is diſtinguiſhable, by the limited ſeat of the former, together with its not being contagious.

The *ulcerated ſore throat*, however is more difficult to diſtinguiſh from this diſeaſe than any other; and yet the diſtinction is a matter of the greateſt importance, as the method of treatment, according to Dr Withering, ought to be extremely different.—But although, in a number of circumſtances, theſe two diſeaſes bear a very great reſemblance, yet, with a little attention, the one may in general, he thinks, be diſtinguiſhed from the other. From Dr Fothergill's account of the ſore throat attended with ulcers, our author has made out the following characteriſtical circumſtances of the two diſeaſes, contraſted to one another.

Scarlatina Anginoſa.	Angina Gangrenoſa.
Seaſon . . Summer. . Autumn.	*Seaſon*. . Spring . . Winter.
Air. . Hot . . Dry.	*Air*. . Warm . . Moiſt.
Places. High . . Dry . . . Gravelly.	*Places*. Cloſe. . Low . . Damp. . Marſhy.
Subjects. Vigorous. Both ſexes alike . . Robuſt in moſt danger. . . .	*Subjects*. Delicate . . Women and female children. Robuſt adults not in danger.
Skin. Full ſcarlet . . . . ſmooth . . If pimply, the pimples white at the top . . Always dry and hot.	*Skin*. Red tinge . . pimply. . The pimples redder than the interſtices . . bedewed with ſweat toward morning.
Eyes. Shining, equable, intenſe redneſs, rarely watery.	*Eyes*. Inflamed and watery, or ſunk and dead.
Throat. In ſummer, tonſils, &c. little tumefied; no ſlough . . In autumn, more ſwelled. Integuments ſeparating . . Sloughs white.	*Throat*. Tonſils, &c. conſiderably ſwelled and ulcerated . . . Sloughs dark brown.
Breath. Very hot, but not fetid.	*Breath*. Offenſive to the patients and aſſiſtants.
Voice. In ſummer, natural.	*Voice*. Flat and rattling.
Bowels. Regular at the acceſſion.	*Bowels*. . Purging at the acceſſation.
Blood. Buffy. . Firm.	*Blood*. . Florid . . Tender.
Termination. The 3d, 5th, 8th, or 11th day.	*Termination*. No ſtated period.
Nature. Inflammatory.	*Nature*. Putrid.

It is not pretended, Dr Withering remarks, that all the above contraſted ſymptoms will be met with in every caſe. It is enough, he obſerves, that ſome of them appear; and that if conjoined with the conſideration of the prevailing conſtitution, they enable us to direct that mode of treatment which will moſt contribute to the relief of the ſick.

But notwithſtanding the attention which Dr Withering has beſtowed upon this ſubject, we are ſtill inclined to think, that the diſeaſe which he has ſo accurately deſcribed under the title of *ſcarlatina anginoſa*, is in reality the ſame affection with the malignant ulcerous ſore throat of Huxham and Fothergill. During different epidemics, this diſeaſe, like ſmall-pox and meaſles in different ſeaſons, is conſiderably varied in its appearance. But ſtill there occurs ſuch a ſimilarity as clearly marks the ſameneſs of the affection. And indeed this, as in the caſe of the ſmall-pox, is abundantly demonſtrated, by infection from one contagion giving protection againſt ſucceeding ones, although the appearances be much varied. This has particularly appeared at Edinburgh, where the diſeaſe has of late prevailed as an epidemic on three different years, viz. 1774-5, 1782-3, and 1789-90. During the firſt of theſe, in the greater part of patients, the ſore throats were of a very gangrenous and malignant nature: during the ſecond, the diſeaſe more commonly appeared under the form of what might be called *ſimple ſcarlatina*: and during the third epidemic, the contagion was, if we may be allowed the expreſſion, of an intermediate nature. But it is farther to be remarked, that during every one of thoſe epidemics, when ſeveral children of a family were at the ſame time ſubjected to the infection, in one the diſeaſe would have been attended with almoſt all the ſymptoms mentioned in the column of *ſcarlatina anginoſa*, with reſpect to ſkin, eyes, throat, breath, bowels, termination of the affections, &c. In another, would have occurred all the ſymptoms with reſpect to thoſe particulars which he has mentioned under the column of *angina gangrenoſa*. While at the ſame time, in numberleſs inſtances, even in the ſame patient, the diſeaſe at its commencement has ſhown evident marks of an inflammatory, and at its termination of a putrid tendency. And there cannot be a doubt, that both the ſcarlatina anginoſa,

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anginoſa, and angina gangrenoſa, as deſcribed by Fothergill and Huxham have occurred in every ſeaſon and ſituation, and have affected perſons of every age and conſtitution not before ſubjected to either diſeaſe.

Cauſes. Dr Withering affirms, that the immediate cauſe of this diſeaſe is a poiſon of a peculiar kind, communicable by contagion.

2. That this poiſon firſt takes poſſeſſion of the mucous membrane lining the fauces and the noſe; and either by its action upon the ſecretory glands, or upon the mucus itſelf, aſſimulates that mucus to its own nature.

3. That it is from this beginning, and from this only, that it ſpreads to the ſtomach, &c. and at length acts upon the ſyſtem at large.

4. That its firſt action upon the nerves is of a ſedative or debilitating nature.

5. That in conſequence of certain laws of the nervous ſyſtem, when the debilitating effects operate upon the ſenſorium commune, a reaction takes place; and that this reaction is, *cæteris paribus*, proportioned to the debilitating power.

6. That, in conſequence of this reaction of the nervous ſyſtem, the vibratory motion of the capillary blood veſſels dependent thereon is greatly encreaſed; an unuſually large quantity of blood is accumulated in thoſe veſſels; the heart and large blood-veſſels are deprived of their cuſtomary proportion; and hence, though ſtimulated to more frequent contraction, the pulſe muſt neceſſarily be feeble.

7. That as violent exertions are followed by debility, upon the ceſſation of the fever, the capillary veſſels, which had acted with ſuch unuſual violence, are left in a ſtate of extreme debility, and are long in recovering their tone; hence it is that ſo many patients afterwards become dropſical.

Dr Withering next proceeds to the conſideration of the different remedies, which either are at preſent in common uſe or have been recommended as proper in this diſeaſe.

Cure. Blood-letting has been recommended by authors; but ſuch was the ſtate of the pulſe in this diſorder, at leaſt during the ſummer months, that it was not in any inſtance thought adviſable to take away blood. In ſome caſes, indeed, where the fiery redneſs of the eyes ſeemed to demand the uſe of leeches, they were had recourſe to, but never with any advantage. In the harveſt months, when the pulſe was more firm, and when ſuffocation ſeemed to be threatened from the ſwelling in the fauces, blood-letting was ſometimes adviſed; but ſtill with leſs advantage than one would have expected in almoſt any other ſituation.

Vomiting.] This, our author obſerves, ſeems to be the remedy of nature; and he is ſurpriſed how it ſhould have been omitted by ſeveral authors who have gone before him. Vomiting, he ſays, moſt amply fulfils the indications ariſing both from a conſideration of the cauſe and of the effects; and a liberal uſe of the remedy he holds forth as the true foundation for ſucceſsful practice in ſcarlet fever and ſore throat. His common form of emetic is a combination of tartar emetic and ipecacuanha, given in pretty ſmart doſes; and theſe are to be repeated at leaſt once in 48 hours, and in the worſt caſes ſo often as twice in 24 hours.

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Purging.] The action of purgatives is conſidered by Dr Withering as altogether repugnant to the curative indications in this diſeaſe: for the poiſons, as formerly remarked, being received into the ſyſtem by the fauces, the operation of a purge, inſtead of diſcharging it, can only promote its diffuſion along the alimentary canal; and in fact, we are told, that when even a ſpontaneous purging ſupervenes in this diſeaſe, the patients ſink ſo amazingly faſt, that it is not within the reach of art to ſupport them. When, however, a conſiderable quantity of acrid matter paſſing from the fauces into the ſtomach, makes its way to the rectum, a conſiderable degree of looſeneſs often takes place. And although evacuations from the ſyſtem in general by means of cathartics may be hurtful, yet patients often obtain great relief from a free diſcharge of this matter; and by diſcharging it, purgatives have the effect even of preventing an evacuation from the ſyſtem, which would otherwiſe take place.

Sudorifics. Cordials. Alexipharmics.] None of theſe remedies were found beneficial. With reſpect to cordials, Dr Withering obſerves, that altho' they ſeem to be indicated by the great loſs of ſtrength and feeble pulſe, yet the certain conſequence of their uſe always was, an increaſe of reſtleſſneſs, of the delirium and of the heat.

Diuretics.] Theſe were found very beneficial. The vegetable fixed alkali is recommended as the moſt proper article of this kind: a dram or two may be eaſily ſwallowed every 4 hours, by giving a ſmall quantity in every thing the patient drinks. Diuretics, however, have been found principally ſerviceable by practitioners in general in thoſe caſes where the urine is obſerved to be ſcanty, and where dropſical ſymptoms have taken place.

Peruvian bark.] No medicine, we are told, ever had a fairer trial in any diſeaſe than the Peruvian bark had in this epidemic; for the feeble pulſe, great proſtration of ſtrength, with here and there a livid ſpot were thought to be ſuch undeniable evidences of a putrid tendency, that the bark was poured down not with a ſparing hand. But this was only at firſt; for theſe livid ſpots and the ſloughs in the throat being found to be the effects of inflammation inſtead of putrefaction, and the bark inſtead of diminiſhing, rather increaſing theſe ſymptoms, it was at laſt entirely laid aſide by Dr Withering in his practice. But although Peruvian bark may not have been ſucceſsful with a particular epidemic at a particular place; yet from the concurring teſtimony of many practitioners, it is very commonly found to be productive of good effects: And there is perhaps no remedy in which greater dependence is in general put, particularly in the advanced periods of the diſeaſe, where the fœtor is conſiderable.

Upon the ſame principles that the bark was preſcribed, fixable air was at firſt likewiſe adviſed, but with no evident effects either one way or another. Dulcified acids were alſo had recourſe to, but with no advantage.

Opiates.] Theſe, although recommended by ſome authors

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anthers for the removal of inquietude and watchfulneſs, yet in this epidemic, inſtead of effecting theſe purpoſes, always increaſed the diſtreſs of the patient.

Bliſters.] In the ſummer appearance of the diſeaſe, bliſters were univerſally detrimental; they never failed to haſten the delirium; and if the caſe was of the worſt kind, they too often confirmed its fatal tendency. But although this may have been the caſe during the epidemic which Dr Withering deſcribes, it has by no means been generally obſerved. On the contrary, by the early application of bliſters to the external fauces, both the glandular ſwellings and likewiſe the diſcharge from the mouth and fauces have been much diminiſhed; and practitioners have believed, not without probable reaſon, that the after affections of the throat were leſs conſiderable than would otherwiſe have been the caſe. Dr Withering allows, that in the autumnal ſeaſon, when the inflammation was leſs generally diffuſed through the body, they were leſs detrimental; but he thinks that they did not here produce any beneficial effects.

Injected gargles of contrayerva decoction, ſweetened with oxymel of ſquills, &c. were found very beneficial in bringing always large quantities of viſcid ropy ſtuff from the fauces.

The immerſion of the feet and legs in warm water, although it did no harm, yet did not either procure ſleep or abate the delirium, as it frequently does in other kinds of fever.

As in ſummer it was found difficult to keep the patients ſufficiently cool, they were ordered to lie upon a matraſs inſtead of a feather-bed; a free circulation of air was kept up; and where the patient's ſtrength would admit of it, they were ordered frequently out of doors. Animal food and fermented liquors were denied them, and nothing allowed but tea, coffee, chocolate, milk and water, gruel, barley-water, and ſuch articles.

With reſpect to the dropſical diſorder which ſo frequently ſucceeds to this complaint, it was never obſerved, Dr Withering remarks, when the preceding ſymptoms had been properly treated.

When called upon to patients in the dropſical ſtate, he began his practice by a doſe of calomel at night and a purgative in the morning. When a febrile pulſe attended the other ſymptoms, emetics were uſeful, as well as the ſaline draughts and other neutral ſalts. When great debility, comatoſe or peripneumonic ſymptoms occurred, bliſters were found very ſerviceable: but when dropſical ſymptoms were the principal cauſe of complaint, ſmall doſes of rhubarb and calomel were adviſed; recourſe was alſo had to diluted ſolutions of fixed alkalies, ſquills, Seltzer waters, and other diuretics.

When the urine flows freely, ſteel and other tonics are recommended; together with gentle exerciſe, high-ſeaſoned food, wine, and the wearing of flannel in contact with the ſkin.

Dr Withering concludes his eſſay with an enumeration of ſeveral caſes, treated according to the principles above laid down. The ſucceſsful termination of theſe caſes demonſtrates the propriety of the practice which he has recommended; at leaſt for the epidemic under the form in which it then appeared.

Urticaria.

Genus XXXIII. URTICARIA,

Nettle-rash.

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Febris urticata, *Vog.* 40.
Uredo, *Lin.* 8.
Purpura urticata, *Junck.* 75.
Scarlatina urticata, *Sauv.* ſp. 2.
  Eryſipelatis ſpecies altera, *Sydenham*, ſect. vi. cap. 6.
  Febris ſcarlatina, et febris urticata, *Meyſerey*, Mal. des armées, 291 et ſeq.

Deſcription. This diſeaſe has its Engliſh name from the reſemblance of its eruption to that made by the ſtinging of nettles. Theſe little elevations upon the ſkin in the nettle-raſh often appear inſtantaneouſly, eſpecially if the ſkin be rubbed or ſcratched, and ſeldom ſtay many hours in the ſame place, and ſometimes not many minutes. No part of the body is exempt from them; and where many of them riſe together, and continue an hour or two, the parts are often conſiderably ſwelled, which particularly happens in the face, arms, and hands. Theſe eruptions will continue to infeſt the ſkin, ſometimes in one place and ſometimes in another, for one or two hours at a time, two or three times every day, or perhaps for the greateſt part of the 24 hours.—In ſome perſons they laſt only a few days, in others many months; nay, ſometimes the diſeaſe has laſted for years with very ſhort intervals

But though the eruption of the urticaria reſembles, as already obſerved, that produced by the ſtinging of nettles, it is ſometimes accompanied with long wheals, as if the part had been ſtruck with a whip. Whatever be the ſhape of theſe eminences, they always appear ſolid, without having any cavity or head containing either water or any other liquor: and this affords an eaſy mark whereby this diſeaſe may be diſtinguiſhed from the itch. For it often happens, that the inſufferable itching with which this eruption is attended, provokes the patient to ſcratch the parts ſo violently, that a ſmall part of the cuticle on the top of theſe little tumours is rubbed off; a little ſcab ſucceeds; and when the ſwelling is gone down, there is left an appearance hardly to be diſtinguiſhed from the itch, but by the circumſtance juſt now mentioned. The nettle-raſh alſo further differs from the itch, in not being infectious.

Cauſes, &c. Dr Heberden is inclined to aſcribe this diſtemper to ſome mechanical cauſe outwardly applied to the ſkin. He obſerves that moſt people ſuffer in a ſimilar manner from the real ſtinging of nettles. Cowhage, or, as it is corruptly called, *cow-itch*, a ſort of phaſeolus, or French bean, the pod of which is covered over with a kind of down or hair, and the effect of which upon the ſkin is much the ſame as that of nettles; and almoſt any hairs cut equally ſhort, and ſprinkled upon the ſkin, whenever they happen to ſtick in it, will make the part itch or ſmart in ſuch a manner as to give great uneaſineſs; it is alſo a conſiderable time before the ſkin can be cleared of the finer ones, when once they are ſtrewed upon it.

Reaumur, in the fourth memoir of his Hiſtory of Inſects, deſcribes a ſpecies of caterpillars to which belong

Exanthemata

Urticaria.

long a ſort of hairs almoſt inviſible to the naked eye, which are eaſily detached, and frequently float in the air round their neſt, though it have not been at all diſturbed. The touch of theſe hairs has a ſimilar effect with the cow-itch; that is, they occaſion intolerable itchings, with little bumps and redneſs, ariſing ſometimes to a ſlight inflammation. Theſe he found would continue four or five days, if the animal or the neſt had been much handled; and though they had not been touched at all, yet, by only walking near their neſts, the ſame effects would be brought on, but for a ſhorter time. Theſe hairs affect the ſkin in this manner by ſticking in it, as he could perceive with a glaſs of a great magnifying power; for with one of a ſmall power they were not viſible. The uneaſy ſenſations cauſed by theſe ſmall wounds, not only, as he ſays, laſt ſeveral days, but move from one part of the body to another; ſo that they will ceaſe upon one wriſt, and immediately begin on the other; from the wriſt they will go to the fingers or the face, or even to the parts of the body which are covered. He ſuppoſes, that the motions of the body, when much of this fine down lies near or upon the ſkin, may drive it from one part to another, or change what was lying there inoffenſively to a ſituation fit to make it penetrate into the ſkin. Neither cold water, nor oil, nor ſpirit of wine, with which the parts affected were bathed, had any effect in removing the itching. He thinks the moſt efficacious remedy which he tried for this complaint was to rub the parts ſtrongly with parſley, which inſtantly leſſened the ſenſations, and after two or three hours, entirely freed the patient from them. It is alſo well known, that many ſpecies of caterpillars, by only walking over the hands, will produce ſomething like this effect on the parts which they touch, and undoubtedly from the ſame cauſe.

Dr Heberden aſks, Is it impoſſible that the nettle-raſh ſhould ariſe from the ſame cauſes, or from others ſimilar, which we miſs by looking too deeply for them in the blood and humours? Such (ſays he) may have been its origin in ſome inſtances, where it has laſted only a few days; but where this affection has continued for ſome years, in perſons who change their linen every day, and who bathe frequently all the time, it can hardly be aſcribed to ſuch an external cauſe. He has obſerved it frequently to ariſe from cantharides: but though it has continued many weeks after the removal of the bliſter, yet it might be ſuſpected that this aroſe from the fine ſpiculæ of the cantharides ſticking all this time about the ſkin; it being cuſtomary to ſtrew much of the dry powder of the cantharides over the bliſter-plaſter, whence it may readily be carried to other parts of the body. But it is certain that ſimilar effects will ſometimes follow the internal uſe of wild valerian root, or the eating of fiſh not ſufficiently dreſſed; muſcles, ſhrimps, and even honey, and the kernels of fruits, will alſo ſometimes produce ſymptoms of a ſimilar kind. But whatever be its cauſe, Dr Heberden never ſaw any reaſon to ſuppoſe that the nettle-raſh had in any way vitiated the humours to ſuch a degree as to require the uſe of internal remedies; and if the itching could be certainly and expeditiouſly allayed, there would be no occaſion for any farther cure. He concludes this hiſtory of the diſorder with a caſe communicated to him by Dr Monſey, phyſician of Chelſea-college, and in which the diſeaſe appeared with uncommon violence.

W. A. aged near 30, of a thin ſpare habit, was ſeized with a diſorder attended with ſymptoms of a very uncommon kind. Whenever he went into the air, if the ſun ſhined bright, he was ſeized with a tickling of his fleſh on thoſe parts expoſed to the ſun: this tickling, by his continuing in the air, increaſed to a violent itching, attended with great heat and pain: the ſkin would then be almoſt as red as vermilion, and thicken like leather; and this remained till he went out of the open air, and then abated in about 15 or 20 minutes. This happened only when the ſun was above the horizon; at other times he was what he called *quite well*.—But it was not owing to the heat of the ſun; for the ſun in winter affected him full as much, if not more, and the heat of the fire had no ſuch effect. Thus he was confined to the houſe for 10 years. He tried ſeveral hoſpitals, and had advices from many phyſicians, without the leaſt abatement of his complaints. At laſt it was agreed by a conſultation of phyſicians, that he ſhould try dipping in ſalt-water; which he did at Yarmouth for 13 weeks, without any viſible amendment. One hot day, having pulled off his clothes and gone into the ſea in the middle of the day, the heat diffuſed itſelf ſo violently all over his body, that, by the time he had put on his clothes, his eye-ſight began to fail, and he was compelled to lie down upon the ground to ſave himſelf from falling. The moment he lay down, the faintneſs went off: upon this he got up again; but had no ſooner ariſen, than he found himſelf in the former condition: he therefore lay down again, and immediately recovered. He continued alternately getting up and lying down, till the diſorder began to be exhauſted, which was in about half an hour; and he was frequently obliged to have recourſe to the ſame expedient.

Having at laſt accidentally met with Dr Monſey, this phyſician queſtioned him concerning the cauſe of the diſorder; but nothing could be gueſſed at, excepting that the patient owned he had one winter lived entirely upon bullock's liver and porter, from inability to purchaſe better victuals. A comrade lived with him at that time, on the ſame proviſions; and he alſo was affected in a ſimilar manner, though in a leſs degree, and had recovered. This patient was then firſt put upon a courſe of Dover's ſweating powder without any effect, and, afterwards tried a courſe of nitrous ones with the ſame bad ſucceſs. At laſt Dr Monſey determined to try the effect of mercury, which happily proved effectual in removing this obſtinate and uncommon diſtemper. The patient began with taking five grains of calomel for three nights running, and a cathartic next morning. In this courſe he went on for near a fortnight, at the end of which he found himſelf very ſenſibly relieved. This encouraged him to go on rather too boldly, by which means a ſlight ſalivation enſued; however, that went off ſoon, and in about ſix weeks he was quite well.—Some time after, he was threatened with a return of his diſorder; but this was effectually relieved by a doſe of calomel, which he had afterwards occaſion to repeat for the ſame reaſon, and with the ſame ſucceſs; but at laſt the diſorder ſeemed to be radically cured, by his having no further ſymptoms of a relapſe.

232 Genus XXXIV. PEMPHIGUS.

Pemphigus, *Sauv.* gen. 93. *Sag.* 291.
Morta, *Lin.* 1.
Febris bulloſa, *Vog.* 41.
Pemphigus major, *Sauv.* ſp. 1.
  Exanthemata ſeroſa, *C. Piſon.* Obſ. 150.
  Febris pemphygodes, *Ephem. Germ.* D. I. A. viii. Obſ. 56.
Pemphigus caſtrenſis, *Sauv.* ſp. 2.
  Febres ſyneches, cum veſiculis per pectus et collum ſparſis, *Morton.* App. ad Exerc. II.
Pemphigus Helveticus, *Sauv.* ſp. 3. *Langhans* in Act. Helvet. vol. ii. p. 260. et in *Beſchreibung* des Siementhals, Zurich 1753.

THIS is a very rare diſeaſe, inſomuch that Dr Cullen declares he never ſaw it. He declines taking the deſcriptions of foreign phyſicians: we ſhall therefore content ourſelves with giving an inſtance of this very uncommon diſtemper, as it was obſerved in the infirmary at Aberdeen, and was treated by the late Dr David Stuart, then phyſician to that hoſpital, who ſoon after publiſhed an account of it in the Edinburgh Medical Commentaries. A private ſoldier of the 3d regiment, aged eighteen years formerly a pedlar, and naturally of a healthy conſtitution, was received into the hoſpital at Aberdeen on the 20th of April. About twenty days before that, he had been ſeized with the meaſles when in the country; and, in marching to town, on the ſecond day of their eruption, he was expoſed to cold; upon which they ſuddenly diſappeared.

Having arrived at Aberdeen, he was quartered in a damp, ill-aired, under ground apartment. He then complained of ſickneſs at ſtomach, great oppreſſion about the præcordia, head-ach, laſſitude, and wearineſs, on the leaſt exertion; with ſtiffneſs and rigidity of his knees and other joints. The ſurgeon of the regiment viſited him: he was purged, but with little benefit. About ten days before, he obſerved on the inſide of his thighs a number of very ſmall, diſtinct, red ſpots, a little elevated above the ſurface of the ſkin, and much reſembling the firſt appearance of ſmall-pox. This eruption gradually ſpread itſelf over his whole body, and the puſtules continued every day to increaſe in ſize.

Upon being received into the hoſpital, he complained of head-ach, ſickneſs at ſtomach, oppreſſion about the præcordia, thirſt, ſore throat, with difficulty of ſwallowing; his tongue was foul, his ſkin felt hot and feveriſh; pulſe from 110 to 120, rather depreſſed: belly coſtive: eyes dull and languid, but without delirium. The whole ſurface of his ſkin was interſperſed with veſicles, or phlyctænæ, of the ſize of an ordinary walnut; many of them were larger, eſpecially on the arms and breaſt. In the interſtices, between the veſicles, the appearance of the ſkin was natural, nor was there any redneſs round their baſe; the diſtance from one to another was from half an inch to a handbreadth or more. In ſome places two or three were joined together, like the puſtules in the confluent ſmall-pox. A few veſicles had burſt of themſelves, and formed a whitiſh ſcab or cruſt. Theſe were moſtly on the neck and face; others ſhowed a tolerably laudable pus. However, by far the greateſt number were perfectly entire, turgid, and of a bluiſh colour. Upon opening them, it was evident that the cuticle elevated above the cutis, and diſtended with a thin, yellowiſh, ſemipellucid ſerum, formed this appearance. Nor was the ſurface of the cutis ulcerated or livid; but of a red florid colour, as when the cuticle is ſeparated by a bliſter, or ſuperficial burning. No other perſon laboured under a ſimilar diſeaſe, either in the part of the country from which he came, or when he reſided in Aberdeen.

This caſe was treated in the following manner. The largeſt of the veſicles were ſnipped, and dreſſed with *unguent. e lap. calaminari.* In the evening he was vomited with a ſolution of tartar emetic, given in ſmall quantities and at intervals. This alſo procured two looſe ſtools. And he was ordered for drink, water-gruel acidulated with lemon juice.

"April 16. He ſtill complained of ſickneſs, ſome oppreſſion about his breaſt, and ſore throat; he had ſlept little during the night; his tongue was foul and blackiſh; his ſkin, however, was not ſo hot as the preceding day; his urine was high-coloured, but had the appearance of ſeparation; his pulſe 90, and ſoft; moſt of the ſores on the trunk of the body looked clean. Others, particularly where the veſicles were confluent, ſeemed beginning to ulcerate, and to have a bluiſh ſub-livid appearance. They were dreſſed afreſh with cerate, and he was ordered the following medicines:

R. Decoct. Cort. Peruvian. vi. Vini rubr. Luſitan. ℥iii. M. Hujus mixturæ capiat ʒß. tertia quaque hora

"His acidulated drink was continued; and on account of the very offenſive ſmell on approaching near him, ſome vinegar was placed in a baſon before the bed, and ſprinkled on the floor; and the room was kept properly aired.

"April 17. His ſores looked tolerably clean, unleſs on his arms and thighs; where they were livid, a little ulcerated, and diſcharged a bloody ichor.

"His head-ach, ſickneſs, &c. were moſtly gone; his tongue was rather cleaner; pulſe 68, and ſoft. As the decoction of the bark ſat eaſily on his ſtomach, the following preſcription was ordered:

R. Pulv. ſubtiliſſ. Cort. Peruv. ʒß. Vini rubri Luſitan. aquæ fontan. āā ʒſs. M. ft. Hauſt. tertia quaque hora repetend.

The acidulated drink was continued, and freſh dreſſings applied to the ſores.

"April 18. The little ulcers in his arms and thighs ſtill diſcharged a bloody ichor, and looked ill: his other complaints were better; pulſe 82. The bark had not nauſeated him, and it was continued as well as his former drink.

"April 19. His ſores looked much cleaner and better; the fever was gone, his pulſe natural, and he had no complaint but weakneſs and troubleſome itching of the ſkin: The Peruvian bark, &c. were continued.

"April 20. Some of the ulcers ſtill poured forth a bloody ichor; moſt of them, however, looked well, and had begun to heal—fever gone—medicines continued.

"From the 21ſt of April he went on gaining ſtrength, and his ſores appeared to heal faſt; he was deſired to take only four doſes every day; and by the 27th his ſores, &c. were totally dried up—he had no complaint, and was diſmiſſed cured."

Since the publication of this caſe of pemphigus by Dr Stuart, obſervations on this diſeaſe have been publiſhed by Dr Stephen Dickſon of Dublin in the Tranſactions of the Royal Iriſh Academy. In theſe obſervations, an account is given of ſix different caſes which Dr Dickſon has had an opportunity of ſeeing. Judging from theſe, Dr Dickſon thinks that Dr Cullen's definition of this diſeaſe requires correction; and that it ought to be defined, "a fever accompanied with the ſucceſſive erruption, from different parts of the body, internal as well as external, of veſicles about the ſize of an almond, which become turgid with a faintly yellowiſh ſerum, and in three or four days ſubſide."

From the caſes which have fallen under Dr Dickſon's obſervation, he concludes, that the diſeaſe varies conſiderably as to its mildneſs or malignity. In three of the caſes which he has ſeen, the ſymptoms were extremely mild, but in the other three ſtrong ſymptoms of putreſcency were manifeſted, and the life of the patient was in great danger. With reſpect to the method of cure, he is of opinion, that the general ſymptoms of weakneſs, and tendency to putrefaction, obviouſly point out the proper treatment. Nouriſhment muſt be ſupplied, and the Peruvian bark and wine carefully adminiſtered; and when veſicles appear on internal parts, irritation muſt be guarded againſt by opiates, demulcents, and gentle laxatives.

Some additional obſervations on the ſubject of pemphigus have lately been publiſhed in the London Medical Journal by Mr Thomas Chriſtie. From a caſe which Mr Chriſtie deſcribes, he is diſpoſed to agree with Dr Dickſon in thinking that ſometimes at leaſt pemphigus is not contagious. He remarks, however, that the pemphigus deſcribed by ſome foreign writers was extremely infectious; which he thinks this may lead to a diviſion of the diſeaſe into the two ſpecies, the pemphigus ſimplex and complicatus; both of which, but eſpecially the laſt, ſeem to vary much with reſpect to mildneſs and malignity.

233 GENUS XXXV. APHTHA.

The THRUSH.

Aphtha, *Sauv.* gen. 100. *Lin.* 9. *Sag.* 298. *Boerh.* 978. *Hoffm.* II. 478. *Junck.* 137.
Febris aphthoſa, *Vog.* 44.

The only idiopathic ſpecies is the thruſh to which infants are ſubject; (Aphtha lactucimen, *Sauv.* ſp. 1.)

The aphthæ are whitiſh or aſh-coloured puſtules, invading the uvula, fauces, palate, tonſils, inſide of the cheeks, gums, tongue, and lips. They for the moſt part begin at the uvula, ſending forth a glutinous mucus, and the puſtules covering all or the greateſt number of the parts abovementioned with a thick whitiſh cruſt adhering moſt tenaciouſly. This cruſt does not induce an eſchar on the parts on which it lies by eating into them, but comes off in whole pieces after the puſtules have arrived at maturity. This will often happen in a ſhort time, ſo that the throat and internal parts of the mouth are frequently obſerved to be clean which a few years before were wholly covered with white cruſts. Neither is this diſeaſe confined to the throat and fauces, but is ſaid to affect the œſophagus, ſtomach, and all parts of the alimentary canal. Of this indeed there is no other proof, than that, after a great difficulty of ſwallowing, there is ſometimes an immenſe quantity of apthæ evacuated by ſtool and vomiting, ſuch as the mouth could not be thought capable of containing.

Cauſes, &c. The aphthoſe fever ſeems to be produced by cold and moiſture, as it is found only in the northern countries, and eſpecially in marſhy places; and in them the aphthæ often appear without any fever at all.

Prognoſis. There is no ſymptom by which the coming out of aphthæ can be foretold, though they are common in many fevers; but they themſelves are in general a bad ſymptom, and always ſignify a very tedious diſorder: the danger denoted by them is in proportion to the difficulty of deglutition; and a diarrhœa accompanying them is likewiſe bad. This indeed generally carries off old people when they become affected with aphthæ. The dark-coloured aphthæ alſo are much more dangerous than ſuch as are of a brown or aſh colour; but it is a good ſign when the appetite returns, and the dark-coloured ones are ſucceeded by others of a whiter colour. Neither are thoſe which are unaccompanied with fever ſo dangerous as the other kind.

Cure. As the aphthæ are ſeldom a primary diſeaſe, we muſt generally endeavour to remove the diſorder upon which they depend, after which they will fall off; but in the mean time we are not to neglect applications to the aphthæ themſelves, ſuch as detergent and ſoftening gargles made of the decoction of figs, with the addition of honey of roſes, a little vinegar, and ſome tincture of myrrh.

ORDER IV. HÆMORRHAGIÆ. 234

HÆMORRHAGIES.

Hæmorrhagiæ, *Vog.* Claſs II. Ord. I. *Hoffm.* II. 194. *Junck.* 5.
Sanguifluxus, *Sauv.* Claſs IX. Ord. I. *Sag.* Claſs V. Ord. I.

GENUS XXXVI. EPISTAXIS. 235

BLEEDING at the NOSE.

Hæmorrhagia, *Sauv.* gen. 239. *Lin.* 173. *Sag.* gen. 174.
Hæmorrhagia narium, *Hoffm.* II. 196. *Junck.* 6.
Hæmorrhagia plethorica, *Sauv.* ſp. 2. *Hoffm.* II. 198.

The other ſpecies enumerated by authors are all ſymptomatic.

Deſcription. The milder ſpecies of this hæmorrhagy comes on more frequently in ſummer than in winter, and for the moſt part without giving any warning, or being attended with any inconvenience; but the leſs benign kind is preceded by ſeveral remarkable ſymptoms. Theſe are, congeſtions of the blood ſometimes in one part and ſometimes in another, and which are often very troubleſome in the ſides of the head; there is a redneſs of the cheeks; an inflation of the face, and of the veſſels of the neck and temples; a *tinnitus aurium*; a heavy pain of the eyes, with a prominence, dryneſs, and ſparks; there is a vertiginous affection of the head, with an itching of the noſtrils, and a ſenſe of weight, eſpecially about the root of the noſe. In ſome the ſleep is diſturbed with dreams about blood, fire, &c. Frequently the belly is coſtive, there is a diminution of the quantity of urine, a ſuppreſſion of ſweat, coldneſs of the lower extremities, and tenſion of the hypochondria, eſpecially the right one.

Cauſes, &c. This hæmorrhagy; may occur at any time of life: but moſt commonly happens to young perſons, owing to the peculiar ſtate of the ſyſtem at that time. Sometimes, however, it happens after the *ακμη* and during the ſtate of manhood, at which time it is to be imputed to a plethoric ſtate of the ſyſtem; to a determination of the blood, by habit, to the veſſels of the noſe; or to the particular weakneſs of theſe veſſels.

In all theſe caſes the diſeaſe may be conſidered as an arterial hæmorrhagy, and depending upon an arterial plethora; but it ſometimes occurs in the decline of life, and may then be conſidered as the ſign of a venous plethora in the veſſels of the head. It often happens at any period of life in certain febrile diſeaſes, which are altogether or partly of an inflammatory nature, and which ſhow a particular determination of the blood to the veſſels of the head. As by this evacuation, other diſeaſes are often removed, it may on theſe occaſions be deemed truly *critical*. It happens to perſons of every conſtitution and temperament; but moſt frequently to the plethoric and ſanguine, and more commonly to men than women.

Prognoſis. In young people, the bleeding at the noſe may be canſidered as a ſlight diſeaſe, and ſcarce worth notice. But, even in young perſons, when it recurs very frequently and in great quantity, it is alarming; and is to be conſidered as a mark of an arterial plethora, which in the decline of life may give the blood a determination to parts from which the hæmorrhagy would be more dangerous. And this will require more particular attention as the marks of plethora and congeſtion preceding the hæmorrhagy are more conſiderable, and as the flowing of the blood is attended with a more conſiderable degree of febrile diſorder. Theſe conſequences are more eſpecially to be dreaded, when the epiſtaxis happens to perſons after their *ακμη* returning frequently and violently. Even in the decline of life, however, it may be conſidered as in itſelf very ſalutary; but at the ſame time it is a mark of a dangerous ſtate of the ſyſtem, i. e. of a ſtrong tendency to a venous plethora in the head, and it has accordingly been often followed by apoplexy, palſy, &c. When it happens in febrile diſeaſes, and is in pretty large quantity, it may be generally conſidered as critical and ſalutary; but it is very apt to be too profuſe, and thus becomes dangerous. It ſometimes occurs during the eruptive fever of ſome exanthemata, and is in ſuch caſes ſometimes ſalutary; but if theſe exanthemata be accompanied with any putrid diſpoſition, this hæmorhagy, as well as artificial blood-lettings, may have a very bad tendency.

Cure. The treatment in caſes of epiſtaxes may be referred to two heads. 1*ſt*, The treatment during the time of the diſcharge; and, 2*dly*, The treatment after the diſcharge is ſtopt, with the view of preventing the return of it. During the former of theſe periods, it is neceſſary in the firſt place to conſider whether the diſcharge ſhould be left to its natural courſe, or ſtopped by artificial means. In determining this queſtion, regard muſt be paid to the quantity of the diſcharge; the appearance of the blood; the conſtitution with which epiſtaxis occurs; the former habit of the patient; and the conſequences which reſult from the diſcharge. When, from due conſideration of theſe circumſtances, there is reaſon to fear that further evacuation would be attended with bad conſequences, though this diſeaſe has been generally thought very ſlight, it ſhould ſeldom be left to the conduct of nature; and in all caſes it ſhould be moderated by keeping the patient in cool air, by giving cold drink, by keeping the body and head erect, by avoiding any blowing of the noſe, ſpeaking, or other irritation; and if the blood has flowed for ſome time without ſhowing any tendency to ſtop, we are to attempt the ſuppreſſion of the hæmorrhagy, by preſſing the noſtril from which the blood flows, waſhing the face with cold water, or applying this to ſome other parts of the body. Theſe meaſures Dr Cullen judges to be proper even on the firſt attacks, and in young perſons where the diſeaſe is the leaſt hazardous: but they will ſtill be more requiſite if the diſeaſe frequently recurs without any external violence; if the returns happen to perſons diſpoſed to a plethoric habit; and more particularly if the ſigns of plethora appear in the ſymptoms preceding the diſcharge.

When the bleeding is ſo profuſe that the pulſe becomes weak and the face pale, every means muſt be uſed to put a ſtop to it, and that whether the patient be young or old. Beſides thoſe methods abovementioned, we muſt uſe aſtringents both internal and external; but the latter are the moſt powerful, and the choice of theſe may be left to the ſurgeon. The internal aſtringents are either vegetable or foſſil; but the vegetable aſtringents are ſeldom powerful in the cure of any hæmorrhagies except thoſe of the alimentary canal. The foſſil aſtringents are more active, but differ conſiderably in ſtrength from one another.—The chalybeates appear to have little ſtrength: the preparations of lead are more powerful; but cannot be employed, on account of their pernicious qualities, unleſs in caſes of the utmoſt danger. The *tinctura ſaturnina*, or *antiphthiſica*, is a medicine of very little efficacy, either from the ſmall quantity of lead it contains, or from the particular ſtate in which it is. The ſafeſt and at the ſame time the moſt powerful aſtringent ſeems to be alum.

For ſuppreſſing this and other hæmorrhages, many ſupperſtitious remedies aud charms have been uſed, and ſaid to have been employed with ſucceſs. This has probably been owing to the miſtake of the by-ſtanders, who have ſuppoſed that the ſpontaneous ceſſation of the hæmorrhagy was owing to their remedy. At the ſame time Dr Cullen is of opinion, that ſuch remedies have ſometimes been uſeful, by impreſſing the mind with horror or dread. Opiates have ſometimes proved ſucceſsful in removing hæmorrhagies; and when the fulneſs and inflammatory diatheſis of the ſyſtem have been previouſly taken off by bleeding, they may, in Dr Cullen's opinion, be uſed with ſafety and advantage. Ligatures have been applied upon the limbs, for retarding the return of the venous blood from the extremities; but their uſe ſeems to be ambiguous. In the caſe of profuſe hemorrhagies, no care is to be taken to prevent the patient from fainting, as this is often the moſt certain means of ſtopping them.

236 GENUS XXXVII. HÆMOPTYSIS.
SPITTING of BLOOD.

Hæmoptyſis, *Sauv.* gen. 240. *Lin.* 179. *Vog.* 84.
Sag. gen. 175. *Junck.* 8.
Hæmoptoë, *Boerh.* 1198.
Sanguinis fluxus ex pulmonibus, *Hoffm.* II. 202.

Sp. I. HÆMOPTYSIS from *Plethora.*

Sp. II. HÆMOPTYSIS, from *External Violence.*

Hæmoptyſis accidentalis, *Sauv.* ſp. 1.
Hæmoptyſis habitualis, *Sauv.* ſp. 2.
Hæmoptyſis traumatica, *Sauv.* ſp. 12.

Sp. III. HÆMOPTYSIS with *Phthiſis.*

Hæmoptyſis phthiſica, *Sauv.* ſp. 9.
Hæmoptyſis ex tuberculo pulmonum, *Sauv.* ſp. 10.

Sp. IV. *The Calculous* HÆMOPTYSIS.

Hæmoptyſis calculoſa, *Sauv.* ſp. 14.

Sp. V. *The Vicarious* HÆMOPTYSIS.

Hæmoptyſis catamenialis, *Sauv.* ſp. 4.
Hæmoptyſis periodica, *Sauv.* ſp. 5.

Deſcription. This hemorrhagy commonly begins with a ſenſe of weight and anxiety in the cheſt, ſome uneaſineſs in breathing, pain of the breaſt or other parts of the thorax, and ſome ſenſe of heat under the ſternum; and very often it is preceded by a ſaltiſh taſte in the mouth. Immediately before the appearance of blood, a degree of irritation is felt at the top of the larynx. The perſon attempts to relieve this by hawking, which brings up a little florid and ſomewhat frothy blood. The irritation returns; and in the ſame manner blood of a ſimilar kind is brought up, with ſome noiſe in the wind-pipe, as of air paſſing through a fluid. Sometimes, however, at the very firſt, the blood comes up with coughing, or at leaſt ſomewhat of coughing, and accompanies the hawking abovementioned.

The blood is ſometimes at firſt in very ſmall quantity, and ſoon diſappears; but in other caſes, eſpecially when it frequently recurs, it is in greater quantity, and often continues to appear at times for ſeveral days together. It is ſometimes profuſe, but rarely in ſuch quantity as either by its exceſs or by a ſudden ſuffocation to prove immediately mortal.

It is not always eaſy to diſcover whether the blood evacuated by the mouth proceeds from the internal ſurface of the mouth itſelf, from the fauces or adjoining cavities of the noſe, from the ſtomach, or from the lungs. It is, however, very neceſſary to diſtinguiſh the different caſes; and for this Dr Cullen offers the following conſiderations.

1. When the blood proceeds from ſome part of the internal ſurface of the mouth, it comes out without any hawking or coughing; and generally, upon inſpection, the cauſe is evident.

2. When blood proceeds from the fauces, or adjoining cavities of the noſe, it may be brought out by hawking, and ſometimes by coughing. In this caſe there may be a doubt concerning its real ſource, and the patient may be allowed to pleaſe himſelf with the thoughts that the blood does not come from the lungs. But the phyſician muſt remember that the lungs are much more frequently the ſource of an hemorrhagy than the fauces. The latter ſeldom happens but to perſons who have before been liableto an hemorrhagy from the noſe, or to ſome evident cauſe of eroſion; and in moſt caſes, by looking into the fauces, the diſtillation of the blood from thence will be perceived.

3. When blood proceeds from the lungs the manner in which it is brought up will commonly ſhow from whence it comes; but, independent of that, it may alſo be known from the cauſes of hæmoptyſis from the lungs, to be afterwards mentioned, having preceded.

4. When vomiting accompanies the throwing out of blood from the mouth, we may generally know the ſource from whence it proceeds, by conſidering that blood does not proceed ſo frequently from the ſtomach as from the lungs; that blood proceeding from the ſtomach commonly appears in greater quantity than from the lungs. The pulmonary blood alſo is uſually of a florid colour, and mixed with a little frothy mucus only; but the blood from the ſtomach is of a darker colour, more grumous, and mixed with the other contents of the ſtomach, The coughing or vomiting, as the one or the other happens firſt to ariſe, may ſometimes point out the ſource of the blood; and this hath alſo its peculiar antecedent ſigns and cauſes.

Cauſes, &c. An hæmoptyſis may be produced at any time of life by external violence; and, in adult perſons, while the arterial plethora prevails in the ſyſtem, *i. e.* from the age of 16 to 35, an hæmoptyſis may at any time be produced merely by a plethoric ſtate of the lungs. More frequently, however, it ariſes from a faulty proportion between the capacity of the lungs and that of the reſt of the body. Thus it is often an hereditary diſeaſe, which implies a peculiar and faulty conformation.

This diſeaſe eſpecially happens to perſons who diſcover the ſmaller capacity of their lungs by the narrowneſs of their cheſt, and by the prominence of their ſhoulders; which laſt is a mark of their having been long liable to a difficulty of reſpiration. In ſuch caſes, too, the diſeaſe very frequently happens to perſons of a ſanguine temperament, in whom particularly the arterial plethora prevails. It happens alſo to perſons of a ſlender delicate make, of which a long neck is a mark; to perſons of much ſenſibility and irritability, and therefore of quick parts; to perſons who have formerly been liable to hemorrhagies from the noſe; to thoſe who have ſuffered a ſuppreſſion of any uſual hemorrhagy; the moſt frequent inſtance of which is in females, who have ſuffered a ſuppreſſion of their menſtrual flux; and, laſtly, to perſons who have ſuffered the amputation of any conſiderable limb.

All this conſtitutes the prediſponent cauſe of hæmoptyſis; and the diſeaſe may happen merely from the prediſponent cauſe ariſing to a conſiderable height. But in thoſe who are already prediſpoſed, it is often brought on by the concurrence of various occaſional

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and exciting cauſes. One of theſe, and perhaps a frequent one is external heat; which, even when in no great degree, brings on the diſeaſe in ſpring, and the beginning of ſummer, while the heat rarifies the blood more than it relaxes the ſolids, which had before been contracted by the cold of winter. Another exciting cauſe is a ſudden diminution of the weight of the atmoſphere, eſpecially when concurring with any effort in bodily exercife. The effort too, alone, may often be the exciting cauſe in thoſe who are already prediſpoſed; and more particularly any violent exerciſe of reſpiration. In the prediſpoſed, alſo the diſeaſe may be occaſioned by any degree of external violence.

Prognoſis. Hæmoptyſis may ſometimes be no more dangerous than a hemorrhagy from the noſe; as when it happens to females, in conſequence of a ſuppreſſion of their menſes; when, without any marks of prediſpoſition, it ariſes from external violence; or, from whatever cauſe ariſing, when it leaves no cough, dyſpnœa, or other affection of the lungs, behind it. But, even in theſe caſes, a danger may ariſe from too large a wound being made in the veſſels of the lungs, from any quantity of red blood being left to ſtagnate in the cavity of the bronchiæ, and particularly from any determination of the blood being made into the veſſels of the lungs, which by renewing the hemorrhagy may have theſe conſequences.

Cure. In the treatment of this diſeaſe, with a view of ſtopping the diſcharge, it is firſt neceſſary to have recourſe to thoſe meaſures which tend to diminiſh the impetus by which the blood is expelled. This is to be effected by a removal of plethora when it exiſts; by diminiſhing the general impetus of circulation; by diminiſhing local increaſed action when it takes place in the veſſels of the lungs; and by producing a determination of blood to other parts of the ſyſtem remote from the lungs. But beſides practices diminiſhing impetus, it is often alſo neceſſary to employ ſuch as augment the reſiſtance to the paſſage of blood through the ruptured veſſels of the lungs. With theſe views a variety of practices may be employed, particularly blood-letting, aſtringents, refrigerants, ſedatives, and the like.

On this ſubject Dr Cullen differs from thoſe who preſcribe chalybeates and the Peruvian bark in the cure of hæmoptyſis. Both of theſe, he obſerves, contribute to increaſe the phlogiſtic diatheſis then prevailing in the ſyſtem, and the hæmoptyſis from prediſpoſition is always accompanied with ſuch a diatheſis. Inſtead of theſe, therefore, he recommends blood-letting in greater or ſmaller quantity, and more or leſs frequently repeated as the ſymptoms ſhall direct. At the ſame time cooling purgatives are to be employed, and every part of the antiphlogiſtic regimen is to be ſtrictly enjoined. In the London Medical Obſervations, the uſe of nitre is greatly recommended by Dr Dickſon, to whom its efficacy was made known by Dr Letherland, phyſician to St Thomas's hoſpital. The moſt commodious method of exhibiting it he found was in an electuary. Four ounces of conſerve of roſes were made into an electuary with half an ounce of nitre; of which the bulk of a large nutmeg was directed to be given, four, ſix, or eight times a day, according to the urgency of the caſe. The good effects of this, he tells us, have often aſtoniſhed him; and when given early in the diſeaſe, he ſays he can depend as much upon it for the cure of an hæmoptyſis, as on the bark for the cure of an intermittent. He agrees with Dr Cullen, however, that in thoſe caſes where there is any hardneſs in the pulſe, and which almoſt always happens, there is a neceſſity for veneſection. A cool regimen, and quiet of body and mind, are certainly uſeful; but Dr Cullen obſerves, that ſome kinds of geſtation, ſuch as ſailing and travelling in an eaſy carriage on ſmooth roads, have often proved a remedy. When the cough is very troubleſome, it is abſolutely neceſſary to exhibit frequently a ſmall doſe of an opiate. Dr Dickſon alſo informs us, that the nitre joined with ſpermaceti, or *pulv. e tragacanth. comp.* has produced equally good effects with the electuary abovementioned; in the compoſition of which he at firſt conſidered the conſerve only as a vehicle for the nitre, though he means not to inſinuate that the former is totally deſtitute of efficacy.

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When this hemorhagy has reſiſted other modes of cure, and there is reaſon to apprehend, even from the mere quantity of blood evacuated, that the patient may ſink under the diſcharge, bliſters, particularly when applied to the breaſt, are often had recourſe to with great advantage; and the vitriolic acid, properly diluted, both as an aſtringent and refrigerant, is often employed with very good effects.

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Pulmonary Consumption.

Phthiſis, *Sauv.* gen. 276. *Lin.* 208. *Vog.* 319. *Sag.* 101. *Junck.* 33.
Phthiſis pulmonis, *Boerh.* 1196.
Affectio phthiſica, ſive tabes pulmonalis, *Hoffm.* II. 284.

Sp. I. The *Incipient Phthisis*, without expectoration of *Pus*. 238

Phthiſis incipiens, *Morton.* Phiſiolog. L. II. cap. 3,
Phthiſis ſicca, *Sauv.* ſp. I.

Sp. II. The *Confirmed Phthisis*, with an expectoration of *Pus*. 239

Phthiſis confirmata *auctorum.*
Phthiſis humida, *Sauv.* ſp. 2.

Sometimes, notwithſtanding all the care we can take, the hæmoptyſis will degenerate into a phthiſis pulmonalis, or conſumption of the lungs; and ſometimes an hæmoptyſis will be the conſequence of this dangerous diſorder. It has been indeed ſuppoſed, that an ulceration of the lungs or phthiſis was the natural and almoſt neceſſary conſequence of an hæmoptyſis: but, according to Dr Cullen, this is in general a miſtake; for there are many inſtances of an hæmoptyſis from external violence without being followed by any ulceration. The ſame thing has often been obſerved where the hæmoptyſis aroſe from an internal cauſe; and this not only in young perſons, when the diſeaſe returned for ſeveral times, but when it has often recurred during the courſe of a long life; and it may eaſily be conceived, that a rupture of the veſſels of the lungs, as well as of the veſſels of the noſe, may be ſometimes healed. The cauſes of phthiſis, therefore, Dr Cullen reduces to five heads. 1. An hæmoptyſis. 2. A ſuppuration of the lungs in conſequence of a pneumonia. 3. A catarrh. 4. An aſthma; and, 5. Tubercles.

1. When a phthiſis ariſes from an hæmoptyſis, it is probable that it is occaſioned by particular circumſtances; and what theſe circumſtances are, may not always be eaſily known. It is poſſible, that merely the degree of rupture, or frequently repeated rupture, preventing the wound from healing, may occaſion an ulcer; or it is poſſible, that red blood effuſed, and not brought up entirely by coughing, may, by ſtagnating in the bronchiæ, become acrid, and erode the parts. But theſe hypotheſes are not ſupported by any certain evidence; and from many obſervations we are led to think, that ſeveral other circumſtances muſt concur in producing the diſeaſe from hæmoptyſis.

2. The ſecond cauſe of an ulceration of the lungs mentioned above is a ſuppuration formed in conſequence of pneumonia. When a peneumonia, with ſymptoms neither very violent nor very ſlight, has continued for many days, it is to be feared it will end in a ſuppuration: but this is not to be determined by the number of days; for, not only after the fourth, but even after the tenth day, there have been examples of a peneumonia ending by a reſolution; and if the diſeaſe, has ſuffered ſome intermiſſion, and again recurred there may be inſtances of a reſolution happening at a much later period from the beginning of the diſeaſe than that juſt now mentioned, But, if a moderate diſeaſe, in ſpite of proper remedies employed, be protracted to the 14th day without any conſiderable remiſſion, a ſuppuration is pretty certainly to be expected; and it will be more certain ſtill, if no ſigns of reſolution have appeared, or if an expectoration which had appeared ſhall have again ceaſed, and the difficulty of breathing has continued or increaſed, while the other ſymptoms have been rather abated.

That in a pneumonia, the effuſion is made which may lay the foundation of a ſuppuration, may be concluded from the difficulty of breathing becoming greater when the patient is in a horizontal poſture, or when the patient can lie more eaſily on the affected ſide. That, in ſuch caſes, a ſuppuration is actually begun, may be inferred from the patient's being frequently affected with ſlight cold ſhiverings, and with a ſenſe of cold felt ſometimes in one ſometimes in another part of the body. We form the ſame concluſion alſo from the ſtate of the pulſe, which is commonly leſs frequent and ſofter, but ſometimes quicker than before. That a ſuppuration, is already formed, may be inferred from there being a conſiderable remiſſion of the pain which had before ſubſiſted; while with this the cough and eſpecially the diſpnœa continue, and are rather increaſed. At the ſame time the frequency of the pulſe is rather increaſed, the feveriſh ſtate ſuffers conſiderable exacerbations every evening, and by degrees a hectic fever in all its circumſtances comes to be formed.

In this ſtate of ſymptoms, we conclude very confidently, that an abſceſs, or, as it is called, a *vomica*, is formed in ſome part of the pleura, and moſt frequently in that portion of it inveſting the lungs. Here purulent matter frequently remains for ſome time, as if encloſed in a cyſt; but commonly not long before it comes to be either abſorbed and transfered to ſome other part of the body, or breaks through into the cavity of the lungs, or into that of the thorax. In the latter caſe it produces the diſeaſe called *empyema*, but it is when the matter is poured into the cavity of the bronchiæ that it properly conſtitutes the phthiſis pulmonalis. In the caſe of empyema, the chief circumſtances of a phthiſis are indeed alſo preſent: but we ſhall here conſider only that caſe in which the abſceſs of the lungs gives occaſion to a purulent expectoration.

An abſceſs of the lungs, in conſequence of pneumonia, is not always followed by a phthiſis; for ſometimes a hectic fever is not formed; the matter poured into the bronchiæ is a proper and benign pus, which frequently is coughed up very readily, and ſpit out; and though this purulent expectoration ſhould continue for ſome time, if it be without hectic fever, the ulcer ſoon heals, and every morbid ſypmtom diſappears. This has ſo frequently happened, that we may conclude, that neither the acceſs of the air, nor the conſtant motion of the lungs, will prevent an ulcer of theſe parts from healing if the matter of it be well conditioned. An abſceſs of the lungs, therefore, does not neceſſarily produce the phthiſis pulmonalis; and if it be followed by ſuch a diſeaſe, it muſt be in conſequence of particular circumſtances which corrupt the purulent matter produced, render it unſuitable to the healing of the ulcer, and at the ſame time make it afford an acrimony, which, abſorbed, produces a hectic fever and its conſequences.

The corruption of the matter of ſuch abſceſſes may be owing to ſeveral cauſes; as, 1. That the matter effuſed during the inflammation had not been a pure ſerum fit to be converted into a laudable pus, but had been joined with other matters which prevented that and gave a conſiderable acrimony to the whole. Or 2. That the matter effuſed and converted into pus, merely by long ſtagnation in a vomica, or by its connection with an empyema, had been ſo corrupted as to become unfit for the purpoſe of pus in the healing of the ulcer. Theſe ſeem to be poſſible cauſes of the corruption of matter in abſceſſes, ſo as to make it the occaſion of a phthiſis in perſons otherwiſe ſound; but it is probable that a pneumonic abſceſs eſpecially produces phthiſis when it happens to perſons previouſly diſpoſed to that diſeaſe, and therefore only as concurring with ſome other cauſes of it.

3. The third cauſe ſuppoſed to produce a phthiſis is a catarrh; which, in many caſes, ſeems in length of time to have the expectoration of mucus proper to it gradually changed to an expectoration of pus; and at the ſame time by the addition of a hectic fever, the diſeaſe which was at firſt a pure catarrh, is changed into a phthiſis. But this ſuppoſition is, in the opinions at leaſt of ſome phyſicians, liable to ſeveral difficulties. The catarrh is properly an affection of the mucous glands of the trachea and bronchiæ analogous to the coryza and leſs violent kinds of cynanche tonſillaris, which very ſeldom end in ſuppuration. And although a catarrh ſhould be diſpoſed to do ſo, the ulcer produced might readily heal up, as it does in the caſe of a cynanche tonſillaris; and therefore ſhould not produce a phthiſis.

Further, the catarrh, as purely the effect of cold, is generally a mild diſeaſe as well as of ſhort duration; and, according to Dr Cullen, there are at moſt but very few of the numerous caſes of it, which can be ſaid to have ended in a phthiſis. In all theſe caſes in which this ſeems to have happened, he thinks it probable that the perſons affected were peculiarly prediſpoſed to phthiſis; and the beginning of phthiſis ſo often reſembles a catarrh, that it may have been miſtaken for ſuch a diſeaſe. It often happens alſo, to increaſe the fallacy, that the application of cold, which is the moſt frequent cauſe of catarrh, is alſo frequently the exciting cauſe of the cough, which proves to be the beginning of a phthiſis.

Many phyſicians have ſuppoſed that an acrimony of the fluids eroding ſome of the veſſels of the lungs is a frequent cauſe of ulceration and phthiſis; but this appears to Dr Cullen to be a mere ſuppoſition. He acknowledges, that in many caſes an acrimony ſubſiſting in ſome part of the fluids is the cauſe of the diſeaſe; but obſerves that it is at the ſame time probable, that this acrimony operates by producing tubercles, rather than by any direct eroſion.

But notwithſtanding theſe objections, experience affords numerous examples of caſes in which a diſeaſe long ſubſiſting under the form of catarrh has at laſt degenerated into phthiſis, and proved fatal from ſupervening hectic fever. It muſt, however, at the ſame time be allowed, that catarrh, degenerating into a chronic ſtate after ſubſiſting for many years, has of itſelf often proved fatal without inducing phthiſis.

4. If phthiſis does not frequently follow catarrh, it is ſtill more rarely a conſequence of aſthma. Innumerable examples are unqueſtionably afforded of that diſeaſe ſubſiſting for many years without any ſymptom whatever of phthiſis as a conſequence of it. But at the ſame time, there are unqueſtionable examples of phthiſis deriving its origin from aſthma; which, however, probably happens only in caſes where a peculiar ſtate of the lungs at the ſame time takes place: But without the concurrence of aſthma, this ſtate would not of itſelf have been ſufficient for inducing the affection.

5. Of all the cauſes formerly mentioned, phthiſis moſt frequently ariſes from tubercles. Dr Simmons informs us, that he has had opportunities of inſpecting the bodies of many people who died in this way, and never found them totally abſent. He has likewiſe ſeen them in ſubjects of different ages, who had been troubled with no ſymptoms of an affection of the breaſt during their lifetime. In theſe, however, they were ſmall, and few in number. This proves that they may exiſt without inconvenience till they begin to diſturb the functions of the lungs by their ſize and number; or till ſome degree of inflammation be excited, either by accidental cauſes, or by certain changes that take place within their ſubſtance; for as yet we know but little of their true nature. Theſe little tumors vary in their conſiſtence; in ſome they are compoſed of a pulpy ſubſtance, and in others approach more to the nature of ſcirrhous. They are moſt commonly formed in conſequence of a certain conſtitutional prediſpoſition; but whatever is capable of occaſioning a morbid irritability of the lungs ſeems alſo to be capable of generating them. Thus the ſpaſmodic aſthma frequently ends in tubercles and conſumption; and it is not unuſual for millers, ſtone-cutters, and others, to die conſumptive, from their being ſo conſtantly expoſed to duſt, which in theſe caſes probably acts by producing ſimilar concretions: and Dr Kirkland obſerves, that ſcythe-grinders are ſubject to a diſeaſe of the lungs, from particles of ſand mixing with iron-duſt, which among themſelves they call the *grinders rot*. Turbercles, however, in by much the greater number of inſtances, have their ſource from a ſcrophulous diſpoſition; and ſome eminent phyſicians have ſuppoſed that the generality of pulmonary conſumptions are of this kind. This notion, however, they have perhaps carried too far: they have probably been miſled by theſe tuberculous concretions which, without good reaſon, have been ſuppoſed to be diſeaſed glands, and of courſe analogous to the glandular affections we meet with in the ſcrophula. Tubercles may likewiſe ſometimes be owing to the ſudden repulſion of cutaneous eruptions, or of the matter of exanthemata, &c. or to other cauſes.

The perſons who are moſt liable to conſumption are thoſe of a fair complexion, fine and ſoft ſkin, florid cheeks, and a ſlender make; with high cheek-bones, hollow temples, long neck, ſhoulders ſtanding out like wings, narrow cheſt, and a remarkable prominence of the proceſſes of the os ſacrum. To theſe marks we may add, that of *ſound teeth*, which, as the diſeaſe advances, uſually become of a milky white colour, and more or leſs tranſparent. Of thoſe who are carried off by this diſeaſe, Dr Simmons aſſerts, the greater number will be found never to have had a carious tooth. This circumſtance, however, does not ſeem to us to hold ſo generally as Dr Simmons is diſpoſed to imagine: and inſtances not unfrequently occur of patients dying of phthiſis, although they have had many teeth ſubjected to caries; and ſome of theſe beginning even at an early period of life.

Perſons of the above deſcription often remain for a long time without feeling any other inconvenience than ſome oppreſſion at the breaſt in moiſt weather, or in hot apartments. Their breathing is eaſily hurried, ſometimes by the ſlighteſt motion; and they become languid, paler, and thinner. All this time, however, they feel no heat or painful ſenſation in the breaſt. As the evil increaſes, the patient begins to be attacked with a ſlight, frequent, and dry cough, which is moſt troubleſome in the night-time. But this, by proper care, is often relieved; and the patient remains in this ſtate for a conſiderable time, and even for many years, if he be ſenſible of his danger, and careful to guard againſt it by a ſuitable manner of living. More commonly, however, we find the cough increaſing, and ſometimes accompanied with more or leſs catarrh. This is uſually aſcribed to cold; and but too generally neglected, till the diſeaſe become alarming by its obſtinacy and its effects. This may be conſidered as the *beginning*, or firſt period, of the diſeaſe. During this ſtage, the cough is ſometimes dry from the firſt; and ſometimes, when it begins in the form of a catarrh, is attended with more or leſs expectoration of mucus.

When the cough begins in the form of a catarrh, and appears to be occaſioned by an increaſed ſecretion of a thin ſaltiſh mucus irritating the membrane of the trachea, all judicious practitioners agree in recommending an attention to regimen, the free uſe of diluting liquors, bland emulſions, ſmall doſes of nitre, the taking away a few ounces of blood if there be much

in

inflammation, the inhaling the ſteams of warm water by means of the machine contrived for that purpoſe, and occaſional uſe of ſuch a doſe of elixir paregoricum as, will be ſufficient to allay the irritation of the bronchiæ, and to promote a gentle moiſture on the ſkin. Theſe methods will generally be found to be efficacious, eſpecially if the patient's chamber be of a moderate temperature, and he carefully avoid expoſure to a cold, damp, or raw air, till the complaint be removed. In caſes in which the cough has been obſtinate, and the inflammatory ſymptoms conſiderable, Dr Simmons has often experienced the great advantages of the warm bath, the heat of which did not exceed 92. When this is had recourſe to, the patient ſhould remain in it only a very few minutes, and go ſoon afterwards to bed; but not with a view to force ſweat by an increaſed weight of bed-clothes, as is too often injudiciouſly practiſed.

Patients of a conſumptive habit, who have had an attack of this kind at the beginning of winter, are particularly liable to a return of the complaint during the continuance of the cold ſeaſon, on the ſlighteſt occaſion and with greater violence. A relapſe is therefore to be carefully guarded againſt; and nothing will be found to do this more effectually than the uſe of ſocks and a flannel under-waiſtcoat. The uſe of flannel has been condemned by ſeveral medical writers as increaſing the inſenſible perſpiration; but in the preſent caſe, to ſay nothing of ſome others in which it may be uſeful, it will in general be found to have the beſt effects. It will prevent a too great determination to the lungs, and ſhould not be left off till the approach of ſummer. In ſome few inſtances in which flannel was found to have a diſagreeable effect, a piece of dimity, worn over the breaſt next the ſkin, prevented the return of colds and coughs in perſons of a delicate habit, who had before been liable to them on the ſlighteſt occaſions, Shirts made of cotton cloth are much more effectual than linen in preſerving an equable temperature of the ſurface, and guarding againſt the action of external cold; while at the ſame time they are much more pleaſant to moſt people than even the fineſt flannel. In theſe caſes, circumſtances that are ſeemingly of the moſt triffling nature become of importance.

Sometimes the cough is occaſioned by an immediate inflammation of ſome part of the lungs, from ſome of the uſual cauſes of inflammation; and when this happens no time is to be loſt in removing it. To do this will perhaps require more than one bleeding, together with a ſtrict attention to a cooling plan of diet diluting drinks, the inhalation of warm ſteams, and if convenient the uſe of the warm bath: but above all, the ſpeedy application of a large bliſter as near as may be to the ſuppoſed ſeat of the inflammation. The cough, in this caſe, will often remain after the original complaint is abated. A prudent uſe of opiates at bed-time, either by themſelves or combined with gummy and mucilaginous medicines, will then generally be uſed as a ſedative and antiſpaſmodic.

In this, as well as in the catarrhal cough juſt now mentioned, many practitioners are too eager to adminiſter the Peruvian bark, with the view, as they term it, of *bracing up* the patient: but this never fails to increaſe the cough, and of courſe to do great and very often irreparable miſchief.

And here it will not be foreign to our ſubject to obſerve, that a ſymptomatic cough, which has its riſe not from catarrh or from an immediate inflammation of the lungs, but from their ſympathy with the ſtomach, has ſometimes laid the foundation of phthiſis, from its having been miſtaken, and of courſe improperly treated. It ſeems to be owing to a redundancy or vitiated ſtate of the bile or to ſome affection of the ſtomach, which it is perhaps not eaſy to define. It is ſometimes a concomitant of other bilious ſymptoms; and when this happens to be the caſe, it cannot eaſily be miſtaken; but we ſometimes find it occuring ſingly, and in general attacking perſons of a ſedentary life. Dr Stoll of Vienna, who has noticed this cough has very properly given it the name of *tuſſis ſtomachica*. This complaint is ſo far from being relieved by bleeding that it conſtantly grows worſe after it, eſpecially if the evacuation be in any conſiderable quantity. The oily remedies ſeldom fail to exaſperate this cough, which at firſt is dry, frequent, and often extremely violent, but which ſeldom fails to give way to one or two gentle pukes, and the occaſional uſe of mild cathartics. The cough, as in other caſes, often continues from habit after the cauſe that gave riſe to it has been removed, and may then be checked by opiates,

When the diſeaſe has been neglected, or our attempts to remove it in the beginning have failed, both of which circumſtances but too frequently happen, the patient begins to complain of a ſoreneſs, and of ſlight lancinating pains ſhooting through the breaſt ſometimes in the direction of the mediaſtinum, and ſometimes confined chiefly to one ſide. The ſoreneſs is pretty conſtant, and much increaſed by the cough. The pain in the ſide often prevents the patient from lying on the ſide affected; and this inability of lying except on one ſide, frequently occurs even when no ſuch pain is felt. In this ſtage of the diſeaſe, fluſhing heats are felt in the palms of the hands and ſoles of the feet: the breathing is ſhort and laborious; and it is not long before the patient begins to expectorate a thin and frothy phlegm, at firſt in ſmall quantities coughed up with difficulty, and ſome pain of the breaſt and now and then ſtreaked with blood: this may be conſidered as the *inflammatory period* of the diſeaſe, to which ſucceeds the *ſuppurative ſtage*. In the latter, the expectoration becomes more copious and purulent, the breath proportionably offenſive, and the exacerbations of the hectic fever more conſiderable: an increaſed quickneſs of the pulſe comes on about the middle of the day; but the moſt conſiderable paroxyſm of the fever is at night, and at firſt continues till towards morning, commonly till three or four o'clock, when it terminates in a ſweat, which uſually begins upon the breaſt. As the diſeaſe advances, theſe ſweats become more profuſe, and ſome times come on almoſt as ſoon as the pulſe begins to quicken, but without affording any relief to the patient. During the exacerbations, we obſerve a circumſcribed redneſs of the cheeks, while the reſt of the face is pale, and appears as if it were not clean waſhed. The coſtiveneſs that commonly accompanies the beginning of the diſeaſe is uſually ſucceeded by a diarrhœa; the ſpitting leſſens and all the purulent matter ſeems to be carried downwards. The waſting of the fat, and the loſs of nouriſhment occaſion the nails to curve inwards, the hair to fall off, and the eyes to ſink in their ſockets. In the mean time, the legs commonly ſwell; till at length death cloſes a ſcene which is melancholy to all but the patient himſelf, who in general continues ſenſible to the laſt moment, and even then indulges a vain hope of prolonging a miſerable exiſtence. In ſome caſes, and that not unfrequently, a delirium comes on towards the cloſe of the diſeaſe.

The hectic fever that attends this and ſome other chronic diſeaſes is evidently the effect of acrimony, and moſt commonly of pus abſorbed and carried into the circulation. The nature of this acrimony, and the different irritability of different patients, are probably the ſources of the variety we obſerve in fevers of this denomination; a variety which is doubtleſs much greater than we are aware of. Thus we find that the matter of the ſmall-pox excites a fever of this kind; but this *ſecondary fever*, as it is called, differs from the hectic attendant on conſumptions; nor does the latter correſpond with that which ſometimes accompanies the ſuppuration of a cancerous ulcer. In the pulmonary conſumption, or at leaſt in the third ſtage of it, the fever induced often appears to be of the putrid kind, and has been denominated *febris hectica putrida* by the judicious Morton, who conſiders it as being combined with a peripneumonic or inflammatory fever, which recurs as often as freſh tubercles begin to inflame. For although we have named one period of the diſeaſe the *inflammatory*, and another the *ſuppurative period*, yet we are not to ſuppoſe that the latter is exempt from inflammation. While matter is poured into the bronchiæ, or abſorbed and carried into the ſyſtem from one part of the lungs, other parts are in a crude ſtate of inflammation, or advancing towards ſuppuration: ſo that, on examining the lungs of perſons who die conſumptive, we find ſome tubercles that are ſmall and juſt formed, ſome that are large and full of matter, and others that are in a ſtate of ulceration. This eaſily accounts for the occaſional combination of inflammatory ſymptoms with thoſe of the putrid hectic. When the matter abſorbed is a laudable pus, as in the caſe of a pſoas abſceſs, we find the form of the hectic fever differing from either of thoſe we have mentioned.

Cure. In theſe different periods of the diſeaſe, the curative indications are ſufficiently obvious. To prevent the formation of freſh tubercles; to obviate the inflammation of thoſe already formed; to promote their reſolution; to allay morbid irritability, the cough, and other troubleſome ſymptoms; and, above all, to check the tendency to the hectic ſtate, are the views that every rational phyſician propoſes to himſelf in the treatment of the genuine conſumption. We know of no medicines that can exert their ſpecific effects upon the lungs by diſſolving tuberculous concretions; nor is it probable, from what we know of the animal œconomy, that any ſuch will ever be diſcovered. Yet medicines that operate in a general manner upon the ſyſtem, may, by promoting abſorption, and diminiſhing the determination to the lungs, tend to diſperſe tubercles, or to prevent their formation. There are not wanting inſtances of wonderful recoveries in caſes where the evil was ſuppoſed to be beyond the power of phyſic; and in ſome, where nature was left to herſelf; ſo that a phyſician who has obſerved the various and powerful reſources nature has within herſelf, will be very cautious how he aſſerts that a diſeaſe is incurable.

The moſt formidable effects of ulcerated lungs are the abſorption and conſequent hectic. It ſeems evident, that, in many caſes, death is brought on by this, rather than by the lungs themſelves being rendered unfit for the purpoſes of reſpiration. So that if we can obviate the effects of the abſorption, diminiſh the preternatural determination to the lungs, and fulfil the other general indications juſt now mentioned, we may very often enable nature to recover herſelf. It may be alleged indeed, that the phyſician's art has hitherto proved very unſucceſsful in theſe caſes; but may not this be owing to the remedies that are employed being very often ſuch as are inimical to the cure;

The Peruvian bark is, perhaps, the moſt commonly employed of any, and often confided in as an ultimate reſource in theſe caſes. But beſides this, the elixir of vitriol, the balſams, and frequent bleedings, have each had their partizans. The uſe of bliſters and iſſues, opiates, a milk and vegetable diet, exerciſe, and change of air, are pretty generally recommended by all. Concerning the bark, Default long ago obſerved, that it had been productive of great miſchief in conſumptive caſes; and Dr Fothergill, in a paper lately publiſhed by him on this ſubject, very judiciouſly remarks, that the bark is ſo far from curing the hectic fever ariſing from diſtempered lungs, that according to the beſt of his obſervations, it not only takes up that time which might probably have been better employed in the uſe of other medicines, but for the moſt part aggravates the diſeaſe beyond remedy. Indeed it has been the opinion of ſeveral attentive obſervers, that, whenever pus or or any kind of matter excites an hectic fever, by being abſorbed and carried into the circulation, the Peruvian bark will never fail to exaſperate the complaint, eſpecially if it be accompanied with any degree of inflammatory diatheſis, unleſs the matter has a free outlet from the ſyſtem; as in the caſe of abſceſſes, for inſtance, in which we often find the bark productive of excellent effects. It is likewiſe well known to be uſed as a tonic, to obviate the effects of fluor albus, or any other immoderate evacuation in delicate perſons, which, by enfeebling the ſyſtem, very often lays the foundation of phthiſis: but the moment we have reaſon to ſuſpect that the lungs are ulcerated, eſpecially if this ulceration be atttended with an inflammatory diſpoſition; or if the ſeparation of vitiated pus be the conſequence of a peculiar increaſed morbid action of the veſſels at the part, it ought to be laid aſide; and in the genuine tuberculous conſumption, perhaps it is at all times inadmiſſible.

Dr Fothergill, however, obſerves, that there are two cauſes of conſumptions, which often produce ſymptoms ſo ſimilar to thoſe of the genuine phthiſis, as ſometimes to have led him to make uſe of the bark in apparent tendencies to a genuine pulmonary conſumption with advantage.

One of theſe cauſes is, the ſuckling of children longer than is conſiſtent with the mother's ability.

Hemorrhagiæ

This caſe frequently occurs among the middling and lower claſſes of females of conſtitutions naturally delicate and tender. In ſuch a ſtate of weakneſs, ſome ſlight cold brings on a cough, which increaſes gradually, till at length it produces the true pulmonary conſumption. Here the bark given early, in moderate doſes, and merely as a tonic remedy, is often of excellent uſe.

Another cauſe is, any weakening diſcharge, either from abſceſſes, the greater operations of ſurgery, a copious and conſtant *fluor albus*, or ſimilar enfeebling evacuations. That the bark is, for the moſt part, of uſe in theſe caſes, when the lungs are not inflamed, is indubitable; and if they be ſo affected, but not beyond a certain degree, it is alſo efficacious in preventing the progreſs of the conſumption.

In phthiſical complaints ſucceeding ſuch ſituations, a prudent trial of the bark ſeems neceſſary. Small doſes of the decoction, either alone, or joined with the ſaline mixture or ſuch other additions as the phyſician thinks proper, may be given. But if the breath becomes more tight and oppreſſed, the cough dry, the pulſe more quick and hard, and eſpecially if ſlight tranſitory pains or ſtitches about the thorax are more frequently complained of, a perſeverance in the uſe of the bark will increaſe the diſeaſe. If ſuch alſo ſhould be the appearances in the progreſs of the diſeaſe, or, from whatever cauſe, if the bark be accompanied with ſuch effects, the uſe of it ought to be with-held.

If, on the other hand, no pain, tightneſs, or oppreſſion is perceived, and there appears a manifeſt abatement of the ſymptoms, it will be adviſable to proceed. The adminiſtration of this medicine, however, requires a judicious obſerver; and it ought neither to be given in the early inflammatory ſtage of this diſeaſe, nor be continued in any ſubſequent period, if it produce the effects abovementioned.

By its tonic virtues it will often enable nature to conquer many difficulties. In confirmation of this remark, Dr Fothergill farther obſerves, that he has ſeen it of uſe in promoting expectoration, when this became deficient from want of ſtrength towards the end of peripneumonic fevers; but that it ſtops this diſcharge, changes ſlight wandering pains into ſuch as are fixed, and increaſes them with all their conſequences, in a variety of caſes.

The elixir of vitriol, or the pure vitriolic acid properly diluted, though in many inſtances a highly uſeful remedy, is often exhibited in conſumptive caſes with no leſs impropriety than the bark. This medicine, from its aſtringency, is obviouſly improper in the inflammatory ſtate of the diſeaſe. But in the latter ſtage, when a general tendency to putrefaction takes place, it is ſerviceable in reſiſting the effect; it reſtrains the colliquative ſweats; and if the lungs be not injured paſt reparation, it is allowed to be a very uſeful auxiliary.

Various are the opinions concerning the efficacy of Briſtol water in this diſeaſe. The experienced author laſt mentioned informs us, that he has ſeen many perſons recover from pulmonary diſeaſes after drinking theſe waters, whoſe cure ſeemed to be doubtful from any other proceſs; and he thinks this circumſtance, added to the general reputation of Briſtol-waters in phthiſical caſes, affords ſufficient inducement to recommend the trial of them in the early ſtages of ſuch complaints. It is, however, before the approach of a confirmed phthiſis that patients ought to repair to Briſtol; otherwiſe a journey thither will not only be without benefit, but may even prove detrimental.

Phthiſis.

Some have imagined, that the journey, a better air, change of ſituation and of objects, have contributed to the patient's recovery; and theſe may doubtleſs be of advantage. It ſeems, however, that the water drank freſh at the pump, actually contains principles conducive to the recovery of patients affected with phthiſical complaints. It ſeems to poſſeſs a ſlight calcareous ſtypticity, and perhaps the air it contains may alſo have an antiſeptic quality. On the whole, it appears to be an efficacious medicine, and is often found of remarkable benefit to conſumptive patients.

Change of air, particularly from good to bad, is of great conſequence in all chronic diſeaſes of the lungs. In conſumptive caſes, the air of all large cities is found to be particularly injurious.

A ſea-voyage has been much recommended in the cure of this diſeaſe. The benefit of exerciſe has alſo been ſtrongly urged by many writers; but, however ſalutary when properly uſed, it certainly ought to be regulated with diſcretion. Dr Dickſon declares himſelf of opinion, that riding on horſeback in conſumptive caſes is moſt commonly hurtful, without ſuch regulations as in general have been little regarded. For inſtance, he has known a perſon who, by a ride of an hour or two in the morning, was very much recruited, and who, at another time, in the afternoon and evening, without undergoing more bodily motion, has returned faint and languid, and apparently worſe. This obſervation on the ſame perſon has been ſo frequently made, as to point out clearly the times when this exerciſe ſhall not do hurt in conſumptive caſes. In this diſeaſe, the pulſe, however calm in the morning, becomes more frequent in the afternoon and night, attended with heat and other feveriſh ſymptoms. Exerciſe therefore, at this time, can only add to the miſchief of the fever. For this reaſon he prudently recommends to all hectic perſons, eſpecially thoſe who ſhall travel to diſtant places on account of a better air, or the benefit expected from any particular water, that their travelling ſhould be ſlow, confined to a very few hours, and only in the morning.

Exerciſe on horſe-back ſeems to be chiefly beneficial in thoſe caſes where conſumption is a ſecondary diſeaſe. For example, in the nervous atrophy; in the hypochondriacal conſumption; or when it is the effect of long continued intermittents, or of congeſtions in any of the abdominal viſcera; or, in a word, whenever the conſumption is not attended with an inflamed or ulcerated ſtate of the lungs; long journeys on horſeback will be beneficial. Such a practice may likewiſe be highly uſeful in obviating an attack of phthiſis, or in carrying off a dry huſky cough in a perſon of a conſumptive habit, when there is reaſon to ſuppoſe that no tubercles are as yet formed. On the other hand, in the confirmed phthiſis, when the lungs are inflamed or ulcerated, much or violent exerciſe will be improper; and there have been inſtances where the death of the patient was evidently accelerated by it. The exerciſe therefore ſhould be gentle, proportioned to the ſtrength of the patient, and employed only in the morning. In fine weather, an eaſy open carriage is perhaps the moſt eligible, not only on account of its being open to the air, but becauſe it affords that kind of agitation which is moſt wanted in theſe caſes. For if we conſider the different modes of exerciſe, we ſhall find that walking, though the beſt exerciſe in health, as it employs the moſt muſcles, is the worſt for the ſickly, who ſhould have the benefit of exerciſe without fatigue. Riding on horſeback agitates the viſcera more than walking, and is therefore preferable to it in many chronic diſeaſes; but when a preternatural determination to the lungs has taken place; it will be liable to increaſe the evil, and may likewiſe be hurtful by the fatigue that attends it. For theſe reaſons it will be prudent to begin with a carriage; and if the patient gain ſtregth, and the diſeaſe abates, recourſe may afterwards be had to horſe-exerciſe.

The gentle motion of a coach has been often found of great utility in pulmonary complaints. Its efficacy ſeems to depend chiefly on its increaſing the determination to the ſurface of the body. The nauſea which this motion excites in ſome perſons is an effect of this increaſed determination. It has therefore been found beneficial in hæmoptyſis; and Dr Simmons mentions the caſe of a lady, who, after trying various remedies to no purpoſe, was cured of this complaint by travelling ſeveral hundred miles through different parts of England in her own coach. At firſt, whenever ſhe tarried three or four days in any place, the diſorder began to return again; but at length by perſevering in her journeys, it gradually went off. Deſault, who practiſed at Bourdeaux about 40 years ago, tells us, he ſent ſeveral conſumptive patients to Bareges, and with good ſucceſs; but that in theſe caſes his reliance was not ſo much upon the Bareges waters, as upon the motion of the carriage and the change of air in a journey of more than 100 leagues.

It is now pretty generally acknowledged, that the good effects of ſea-voyages in conſumptive caſes depend more upon the conſtant and uniform motion of the ſhip, than upon any particular impregnation of the ſea-air; although this from its coolneſs and purity may likewiſe be of great uſe, eſpecially in the hot months, when ſea-voyages are generally undertaken by conſumptive patients. The ancients were no ſtrangers to this remedy; and amongſt the Romans it was no unuſual thing for conſumptive perſons to ſail to Egypt. Pliny obſerves, that this was done not for the ſake of the climate, but merely on account of the length of the voyage.

Many of the Engliſh phyſicians have recommended a voyage to Liſbon in theſe caſes. When this is done, the proper ſeaſon of the year ſhould be carefully attended to. Dr Simmons knew a gentleman who went thither with ſymptoms of incipient phthiſis, and who experienced ſome relief during the courſe of the voyage; but happening to arrive at Liſbon at the beginning of the rainy ſeaſon, the diſeaſe was ſoon greatly increaſed, and terminated fatally.

Another ſpecies of motion has of late been extolled as highly uſeful in conſumptive caſes. Dr James Carmichael Smyth of London, has lately publiſhed an account of the effects of ſwinging, employed as a remedy in the pulmonary conſumption and hectic fever. In this treatiſe Dr Smyth contends, that ſea-air, in place of being of advantage is conſtantly prejudicial to hectic and conſumptive patients, and even to thoſe who have a tendency to ſuch complaints. He thinks, therefore, that the benefit derived from ſea-voyages muſt certainly be referred to ſome other cauſe. In ſtating his ſentiments on this ſubject, he attempts to eſtabliſh a diſtinction between exerciſe and motion. By exerciſe, he underſtands muſcular action, or the exertion of the loco-motive powers of the body either alone or combined. This he repreſents as increaſing the force and frequency of the heart's contraction, the velocity and momentum of the blood, the quickneſs of breathing, the heat, the irritability, and the tranſpiration of the whole body. By motion, in contradiſtinction to exerciſe, he means ſuch motion as is not neceſſarily accompanied with any agitation or ſuccuſſion of the body, and which is totally independent of any muſcular exertion. The effects of this, both on the heart, the lungs, and indeed on the ſyſtem in general, he conſiders as of the ſedative kind; thus it ſuſpends the action of coughing, and leſſens the frequency of the pulſe. He is, therefore, led to refer the good effects of ſea-voyages entirely to this cauſe. And on theſe grounds he was led to conclude, that the motion given by ſwinging might be of equal if not greater ſervice, This concluſion, we are told, in the treatiſe above alluded to, experience in many caſes has fully confirmed. And he recommends it as a mode of cure which may be employed with advantage in every ſtage of phthiſis. While, however, the reaſoning of Dr Smith on this ſubject ſeems to be liable to many objections, we are ſorry to add, that his obſervations in practice have by no means been confirmed by thoſe of others, who have had recourſe to this mode of cure.

The beſt adapted diet in conſumptive caſes is milk, particularly that of aſſes. It may however be remarked, that there are conſtitutions in which this ſalutary nutriment ſeems to diſagree. A propenſity to generate bile, or too ſtrong a diſpoſition to aſcency from a weakneſs of the digeſtive organs, both merit attention. Whey, either from cows or goat's milk, appears to be more ſuitable in the former caſe; and for correcting acidity, lime-water may be added to the milk. The method of adding rum or brandy to aſſes or cows milk, ſhould be uſed with great caution; for when added beyond a certain quantity, as is often the caſe, they not only coagulate the milk, but heat the body; by which means the former diſagrees with the patient, and the ſpirit augments the diſeaſe.

In conſumptive caſes, Dr Simmons obſerves, that the patient's taſte ſhould be conſulted; and ſays that a moderate uſe of animal food, where the ſalted and high-ſeaſoned kinds are avoided, is not to be denied. Shell-fiſh, particularly oyſters, are uſeful as well as ſnails ſwallowed whole, or boiled in milk.

Repeated bleedings, in ſmall quantities, are conſidered in conſumptive caſes as highly advantageous: and in particular circumſtances they undoubtedly are ſo; for inſtance, when the conſtitution apparently abounds with blood; when the fluid drawn off is extremely ſizy; when there is much pain in the breaſt;

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and when veneſection is followed by an abatement of every ſymptom. In theſe caſes, bleeding is certainly proper, and ought to be repeated ſo long as it ſeems to be attended with advantage. In very delicate conſtitutions, however, even where the pulſe is quick, with ſome degree of fulneſs, and the blood laſt drawn conſiderably ſizy, it may not prove equally ſerviceable.

It deſerves to be remarked, that the inflammatory appearance of the blood is not alone a ſufficient reaſon for bleeding; but, in determining the propriety of this evacuation, all other circumſtances ſhould be conſidered; ſuch as the patient's age, ſtrength, habit, and the ſtate of the diſeaſe.

A remark which has been judiciouſly made by Dr Fothergill, ought not to be omitted in the account of this diſeaſe. It is, that young delicate females, from the age of 15 or 16, and upwards, are often ſubject to conſumptions. When the diſeaſe has advanced conſiderably, the *menſes*, if they have made their appearance, moſt generally ceaſe. This alarms their female friends, and they call upon the phyſician to uſe his utmoſt endeavours for reſtoring the diſcharge; believing the ceſſation of it to be the immediate cauſe of the phthiſical complaint. Induced by their ſolicitations, medicines have ſometimes been adminiſtered, which, without obtaining this end, have tended to aggravate the diſtemper. This deficiency is often of no real diſadvantage in thoſe caſes; and in many the evacuation would prove injurious, by diminiſhing the ſtrength, which is already too much impaired. Even ſmall bleedings at the regular periods have often done more harm than good. A ſudden ſuppreſſion may require bleeding: but when the evacuation fails through want of ſtrength, and from poverty of blood, the renewal of it increaſes the diſeaſe.

Beſides theſe remedies, Dr Simmons ſtrongly recommends a frequent repetition of vomits. Many phyſicians have ſuppoſed, that where there is any increaſed determination to the lungs, vomits do miſchief; but Dr Simmons is perſuaded, that inſtead of augmenting they diminiſh this determinatian; and that much good may be expected from a prudent uſe of this remedy, than which none has a more general or powerful effect on the ſyſtem. If any remedy be capable of diſperſing a tubercle, he believes it to be vomits. The affections of the liver, that ſometimes accompany pulmonary complaints, give way to repeated emetics ſooner than to any other remedy. In ſeveral caſes where the cough and the matter expectorated, the fluſhing heats, loſs of appetite, and other ſymptoms, threatened the moſt fatal event; the complaints were greatly relieved, and in others wholly removed, by the frequent uſe of emetics. Other ſuitable remedies were indeed employed at the ſame time; but the relief the patients generally experienced after the emetic, was a ſuffiicient proof of its ſalutary operation. By this, however, he does not mean that vomits will be uſeful in every period of the diſeaſe, or in every patient. In general, it will be found that the earlier in the diſeaſe emetics are had recourſe to, the more likely they will be to do good and the leſs likely to do harm. The caſes in which emetics may be reckoned improper, are commonly thoſe in which the diſeaſe is rapid in its progreſs; or in that ſtage of it when there is great debility, with profuſe colliquative ſweats.

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In theſe caſes, when an emetic has been adminiſtered twice a-week, and the cough is mitigated, the expectoration facilitated, and the other ſymptoms relieved, both the patient and the phyſician will be encouraged to proceed, and to repeat the vomit every ſecond day, or even every day, for ſeveral days together, as Dr Simmons has ſometimes done when the good effects of it were obvious.

The choice of emetics to be employed in theſe caſes is by no means a matter of indifference. Carduus tea, camomile tea, warm water, and others that act by their bulk, and by exciting nauſea, relax the tone of the ſtomach when they are frequently repeated, and of courſe will be improper. More active emetics are therefore to be preferred; and here ſome of the preparations of antimony might naturally be thought of. But the operation of theſe is not confined to the ſtomach. They produce evacuations by ſtool, and a diſpoſition to ſweat; and are therefore improper in the pulmonary hectic. The mildneſs and excellence of ipecacuanha as an emetic, are well known; but in theſe caſes, Dr Simmons has often employed the blue vitriol, concerning the effects of which we meet with ſome groundleſs aſſertions in ſeveral medical books. Its operation is confined to the ſtomach; it acts almoſt inſtantaneouſly, and its aſtringency ſeems to obviate the relaxation that is commonly ſuppoſed to attend the frequent uſe of emetics. In two caſes he experienced its good effects, after vomits of ipecacuanha had been given ineffectually. It ſhould be adminiſtered in the morning, and in the following manner:

Let the patient firſt ſwallow about half a pint of water, and immediately afterwards the vitriol diſſolved in a cupful of water. The doſe of it muſt be adapted to the age and other circumſtances of the patient, and may be varied from two grains to ten, fifteen or twenty. As ſome perſons are much more eaſily puked than others, it will be prudent to begin with a ſmall doſe: not that any dangerous effects will be produced by a large one, for the whole of the medicine is inſtantly rejected; but if the nauſea be violent, and of long continuance, the patient may perhaps be diſcouraged from repeating it. In general, the moment the emetic has reached the ſtomach it is thrown up again. The patient muſt then ſwallow another half pint of water, which is likewiſe ſpeedily rejected; and this is commonly ſufficient to remove the nauſea.

Dr Marryat, in his *New Practice of Phyſic*, preſcribes with great freedom what he calls the *dry vomit*, from its being directed to be taken without drinking. This medicine conſiſts of blue vitriol and the emetic tartar; but its good effects have not yet been aſcertained by other practitioners.

Another remedy which Dr Simmons ſtrongly recommends in conſumptive caſes, both from his own obſervation and on the authority alſo of many other eminent practitioners is gum myrrh. This given by itſelf to the extent of a ſcruple or half a dram for a doſe, two or three times a-day, or, if there be much inflammatory tendency, combined with a proportion of nitre or of cream of tartar, has often been ſerviceable

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able in caſes which were apparently inſtances of incipient phthiſis even of the tuberculous kind. But when the diſeaſe is far advanced, or even decidedly marked, as far as our experience goes it has rarely if ever been productive of any benefit.

Beſides the uſe of internal remedies in pulmonary affections, phyſicians have often preſcribed the ſteams of reſinous and balſamic ſubſtances to be conveyed into the lungs. The vapour of dulcified ſpirit of vitriol, dropt into warm water, has likewiſe been uſed in theſe caſes, and is advertiſed as a noſtrum under the name of *æther*. The inhaling of fixed air has alſo been ſpoken of as an uſeful practice. Dr Simmons has ſeen all of theſe methods tried at different times; but without being able to perceive any real advantages from them in the ſuppurative ſtage of the diſeaſe, where they might be expected to be of the greateſt uſe; and in the beginning he has often found the two firſt to be too ſtimulating. He therefore preferred the ſimple vapour of warm water, and has experienced its excellent effects in ſeveral inſtances; but when the complaint has made any conſiderable progreſs, its utility is leſs obvious; and when the patients have been much weakened, he has ſeen it bring on profuſe ſweats, eſpecially when uſed in bed, and therefore generally recommended it to be uſed in the day-time. Formerly he made uſe of a fumigating machine, deſcribed in the Gentleman's Magazine for 1748, in which the air, inſpired by the patient, is made to paſs through hot water by means of a tube that communicates with the external air, and with the bottom of the veſſel: but we have now a more elegant and (on account of the valve and mouth-piece) a more uſeful inſtrument of this kind, the inhaler, invented by the ingenious Dr Mudge.

Another remedy recommended by ſome as a ſpecific in conſumptions is the earth-bath. Van Swieten, in his Commentaries on Boerhaave, tells us, from the information of a perſon of credit, that in ſome parts of Spain they have a method of curing the phthiſis pulmonalis by the uſe of this remedy; and he quotes the celebrated Solano de Luque in confirmation of this practice. Solano ſpeaks of the *banos de tierra*, or earth-baths, as a very old and common remedy in Granada and ſome parts of Andaluſia, in caſes of hectic fever and conſumptions; and relates ſeveral inſtances of their good effects in his own practice. The method he adopted on theſe occaſions was as follows: He choſe a ſpot of ground on which no plants had been ſown, and there he made a hole large and deep enough to admit the patient up to the chin. The interſtices of the pit were then carefully filled up with the freſh mould, ſo that the earth might every where come in contact with the patient's body. In this ſituation the patient was ſuffered to remain till he began to ſhiver or felt himſelf uneaſy; and during the whole proceſs, Solano occaſionally adminiſtered food or ſome cordial medicine. The patient was then taken out, and, after being wrapped in a linen cloth, was placed upon a matraſs, and two hours afterwards his whole body was rubbed with an ointment, compoſed of the leaves of the *ſolanum nigrum* and hog's lard. He obſerves, that a new pit muſt be made every time the operation is repeated; and adviſes the uſe of theſe baths only from the end of May to the end of October. Dr Fouquet, an ingenious French phyſician, has tried this remedy in two caſes. In one, a confirmed phthiſis, he was unſucceſsful; but the remedy had not a fair trial. The patient, a man 30 years of age, had been for ſeveral months afflicted with cough, hectic fever, and profuſe colliquative ſweats. He was firſt put into the earth in the month of June; but ſoon complained of an uneaſy oppreſſion at his ſtomach, and was removed at the end of ſeven minutes. The ſecond time he was able to remain in it half an hour, and when taken out was treated in the way preſcribed by Solano. In this manner the baths were repeated five times, and the patient was evidently relieved; but having conceived a diſlike to the proceſs, he refuſed to ſubmit to any further trials, and died ſome months afterwards. In the ſecond caſe he was more fortunate: the patient, a girl 11 years of age, had been for three months troubled with a cough brought on by the meaſles, which was at length attended with a purulent expectoration, hectic fever, and night-ſweats. She began the uſe of the earth-bath in Auguſt, and repeated it eight times in the ſpace of 20 days. At the end of that time the fever and diſpoſition to ſweat had entirely ceaſed, and by the uſe of the common remedies the patient was perfectly reſtored. A phyſician at Warſaw has likewiſe preſcribed the earth-bath with good ſucceſs in caſes of hectic fever. The Spaniards confine it entirely to ſuch caſes; but in ſome other parts of the world we find a ſimilar method employed as a remedy for other diſeaſes, and particularly for the ſea-ſcurvy. Dr Prieſtley obſerves, thar the Indians, he has been told, have a cuſtom of burying their patients labouring under putrid diſeaſes up to the chin in freſh mould, which is alſo known to take off the fœtor from flaſh-meat beginning to putrify. The rancidity of a ham for example, may be corrected by burying it for a few hours in the earth. The efficacy of this remedy in the ſea-ſcurvy has, it is ſaid, frequently been experienced by the crews of Eaſt India ſhips.

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Solano, who is fond of philoſophizing in his writings, is of opinion, that the earth applied in this way abſorbs the morbid taint from the ſyſtem: but does it not ſeem more probable, that the effluvia of the earth, by being abſorbed and carried into the circulation, corrects the morbid ſtate of the fluids, and thus are equally uſeful in the ſea-ſcurvy and in the pulmonary hectic? That the earth when moiſtened does emit a grateful odour is a fact generally known; and Baglivi long ago gave his teſtimony in favour of the grateful effects of the effluvia of freſh earth. He aſcribes theſe good effects to the nitre it contains.

The earth-bath, both in conſumptive caſes and likewiſe in a variety of other affections, has of late been extenſively employed in Britain by a celebrated empiric. But, as far as we can learn, in moſt caſes it produced to the patient a very diſtreſſing ſenſation of cold; in ſome, it ſeemed to be productive of bad effects, probably in conſequence of this cold; and we have not heard of any conſumptive caſes in which good effects were decidedly obtained from it.

With regard to the drains, ſuch as bliſters, iſſues, and ſetons, that are ſo frequently recommended in pulmonary complaints, there is leſs danger of abuſe from them than from the practice of veneſection. The diſcharge they excite is not calculated to weaken the patient much; and the relief they have ſo often been found to afford, is a ſufficient reaſon for giving them a trial. Bliſters, as is well known, act in a twofold manner; by obviating ſpaſm, and producing revulſion: Iſſues and ſetons act chiefly in the latter of theſe two ways; and in this reſpect their effects, though leſs ſudden and leſs powerful at firſt, are more durable from the continuance of the diſcharge they occaſion. It is perhaps hardly neceſſary to remark, that, if much ſervice is to be expected from either of theſe remedies, they ſhould be applied early in the diſeaſe. The ingenious, Dr Mudge, who experienced the good effects of a large ſcapulary iſſue on his own perſon, very properly obſerves, that the diſcharge in theſe caſes ought to be conſiderable enough to be felt. But it is ſeldom poſſible for us to prevail on the delicate perſons, who are moſt frequently the victims of this diſeaſe, to ſubmit to the application of a cauſtic between the ſhoulders. The diſcharge produced by a ſeton is by no means inconſiderable; and as in theſe caſes there is generally ſome inflammatory ſtitch, ſome part of the breaſt that is more painful or more affected by a deep inſpiration than the reſt, a ſeton in the ſide, as near as can be to the ſeat of the inflammation, will be an uſeful auxiliary. Dr Simmons has ſeen it evidently of great uſe in ſeveral caſes.

240 GENUS XXXVIII. HÆMORRHOIS.
HEMORRHOIDS, OR PILES.

Hæmorrhois, *Sauv.* gen. 217. *Lin.* 192. *Sag.* gen. 182.
Hæmorrhoidalis fluxus. *Hoffm.* 219.
Hæmorrhoides, *Junck.* 11. and 12.
Leucorrhois, *Vog.* 112.

Sp. I. *External* PILES.
241 Var. A. *Bloody* PILES.

Hæmorrhois moderata, *Sauv.* ſp. 1.
Hæmorrhoides ordinatæ, *Junck.* 11.
Hæmorrhoides nimiæ, *Junck.* 11.
Hæmorrhois immodica, *Sauv.* ſp. 2.
Hæmorrhoides excedentes, *Alberti.* de hæmorrhoid. p. 179.
Hæmorrhois polypoſa. *Sauv.* ſp. 3.

Var. B. *Mucous* PILES.

Hæmorrhoides decoloratæ, albæ, et mucidæ, *Junck.* 13. *Alberti*, p. 248.

242 SP. II. The PILES from a *Procidentia Ani.*

Hæmorrhois ab exania, *Sauv.* ſp. 4.

243 SP. III. The *Running* PILES.
244 SP. IV. The *Blind* PILES.

Hæmorrhoides cœcæ, *Junck.* 12. *Alberti*, p 274

Deſcription. The diſcharge of blood from ſmall tumors on the verge of the anus conſtitutes what is called the *hæmorrhoides* or *piles*. They are diſtinguiſhed into the *external* and *internal*, according to the ſituation of the tumors, either without or within the anus. Sometimes, however, theſe tumors appear without diſcharging any blood; and in this caſe they are called the *hæmorrhoides cœcæ* or *blind piles*. Sometimes the diſeaſe appears without the verge of the anus in diſtinct ſeparate tumors; but frequently only one tumid ring appears, ſeeming as it were the anus puſhed without the body. Sometimes theſe tumors appear without any previous diſorder of the body: but more frequently, before the tumors are formed and ſometimes even before the blood begins to flow, various affections are perceived in different parts of the body; as head-ach, vertigo, ſtupor, difficulty of breathing, ſickneſs, colic pains, pain of the back and loins, and frequently a conſiderable degree of pyrexia; while along with theſe ſymptoms there is a ſenſe of fullneſs, heat, itching, and pain, in and about the anus. Sometimes the diſeaſe is preceded by a ſerous diſcharge from the anus; and ſometimes this ſerous diſcharge, accompanied with ſwelling, ſeems to come in place of the diſcharge of blood, and to relieve the abovementioned diſorders of the ſyſtem. This ſerous diſcharge hath therefore been named the *hæmorrhois alba.*

In this diſeaſe the quantity of blood diſcharged is different upon different occaſions. Sometimes it flows only when the perſon goes to ſtool, and commonly follows the diſcharge of fæces. In other caſes it flows without any diſcharge of fæces; and then generally in conſequence of the diſorders abovementioned, when it is alſo commonly in larger quantity. This is often very conſiderable; and, by the repetition, ſo great, that we could hardly ſuppoſe the body to bear it but with the hazard of life. Indeed, though rarely, it has been ſo great as to prove ſuddenly fatal. Theſe conſiderable diſcharges occur eſpecially to perſons who have been frequently liable to the diſeaſe. They often induce great debility, and frequently a leucophlegmatia or dropſy which proves fatal. Sometimes the tumors and diſcharges of blood in this diſeaſe recur exactly at ſtated periods. In the decline of life it frequently happens that the hæmorrhoidal flux, formerly frequent, ceaſes to flow; and in that caſe it generally happens that the perſons are affected with apoplexy or palſy. Sometimes hæmorrhoidal tumors are affected with inflammation, which ends in ſuppuration, and gives occaſion to the formation of fiſtulous ulcers in thoſe parts.

The hæmorrhoidal tumors have often been conſidered as varices or dilatations of the veins; and in ſome caſes varicous dilatations have appeared upon diſſection. Theſe, however, do not appear in the greater part of caſes; and Dr Cullen is of opinion that they are uſually formed by an effuſion of blood into the cellular texture of the inteſtine near to its extremity. When recently formed, they contain fluid blood; but after they remain for ſome time they are uſually of a firmer conſiſtence, in conſequence of the blood being coagulated.

Cauſes, &c. It would ſeem probable, that the hæmorrhoidal tumors are produced by ſome interruption of the free return of the blood from the rectum, by which a rupture of the extremities of the veins is occaſioned. But conſidering that the hæmorrhagy occuring here is often preceded by pain, inflammation, and a febrile ſtate, and with many other ſymptoms which ſhow a connection of the topical affection with the ſtate of the whole ſyſtem, it is probable that the interruption of the blood in the veins produces a conſiderable reſiſtance to the motion of the blood though the arteries, and conſequently that the diſcharge of blood is commonly from the latter. Some have thought, that a difference of the hæmorrhois, and of its effects upon the ſyſtem, might ariſe from the difference of the hæmorrhoidal veſſels from whence the blood iſſued. But Dr Cullen is of opinion, that we can ſcarce ever diſtinguiſh the veſſels from which the blood flows, and that the frequent inoſculations of both arteries and veins belonging to the lower extremity of the rectum, will render the effects of the hæmorrhagy much the ſame, from whatever ſource it proceeds.

With regard to the hæmorrhoids, however, he is of opinion, that they are, for the moſt part, merely a topical affection. They take place before the period of life at which a venous plethora happens. They happen to females, in whom a venous plethora determined to the hæmorrhoidal veſſels cannot be ſuppoſed to occur; and they happen to both ſexes, and to perſons of all ages, from cauſes which do not affect the ſyſtem, and are manifeſtly ſuited to produce a topical affection only.

Theſe cauſes are, in the firſt place, the frequent voiding of hard and bulky fæces, which, by their long ſtagnation in the rectum, and eſpecially when voided, muſt neceſſarily preſs upon the veins of that part, and interrupt the courſe of the blood in them. For this reaſon the diſeaſe ſo frequently happens to thoſe who are habitually coſtive. From the ſame cauſes, the diſeaſe happens frequently to thoſe who are ſubject to a prolapſus ani. In voiding the fæces, it almoſt always happens that the internal coat of the rectum is more or leſs protruded; and, during this protruſion, it ſometimes happens that the ſphincter ani is contracted: in conſequence of this, a ſtrong conſtriction is made, which preventing the fallen-out gut from being replaced, and at the ſame time preventing the return of blood from it, occaſions a conſiderable ſwelling, and the formation of a tumid ring round the anus.

Upon the ſphincter's being a little relaxed, as it is immediately after its ſtrong contraction, the portion of the gut which had fallen out is commonly taken into the body again; but by the frequent repetition of the accident, the ſize and fulneſs of the ring formed by the prolapſed inteſtine is much increaſed. It is therefore more ſlowly and difficultly replaced; and in this conſiſts the chief uneaſineſs of hæmorrhoidal perſons. As the internal edge of this ring is neceſſarily divided by clefts, the whole often puts on the appearance of a number of diſtinct ſwellings; and it alſo frequently happens, that ſome portions of it are more conſiderably ſwelled, become more protuberant, and form thoſe ſmall tumors more ſtrictly called *hæmorrhoids* or *piles*.

From conſidering that the preſſure of the fæces, and other cauſes interrupting the return of venous blood from the lower extremity of the rectum, may operate a good deal higher up than that extremity, we may underſtand how tumors may be formed within the anus; and probably it alſo happens, that ſome of the tumors formed without the anus may continue when taken within the body, and even be increaſed by the cauſes juſt mentioned. Thus may the production of internal piles be explained, which, on account of their ſituation and bulk, are not protruded on the perſon's going to ſtool, and are therefore more painful.

The production of piles is particularly illuſtrated by this, that pregnant woman are frequently affected with the diſeaſe.—This is to be accounted for, partly from the preſſure of the uterus upon the rectum, and partly from the coſtive habit to which pregnant women are liable. Dr Cullen has known many inſtances of piles happening for the firſt time during the ſtate of pregnancy; and there are few women who have born children, that are afterwards entirely free from piles. —Purgatives alſo, eſpecially thoſe of the more acrid kind, and particularly aloetics, are apt to produce the piles when frequently uſed; and as they ſtimulate particularly the larger inteſtines, they may be juſtly reckoned among the exciting cauſes of this diſeaſe.

Prognoſis. Though the hæmorrhoids are commonly, as we have ſaid, to be eſteemed a topical diſeaſe, they may, by frequent repetition, become habitual and connected with the ſtate of the whole ſyſtem; and this will more readily happen in perſons who have been once affected with the diſeaſe, if they be frequently expoſed to a renewal of the cauſes which occaſioned it. It happens alſo to perſons much expoſed to a congeſtion in the hæmorrhoidal veſſels, in conſequence of their being often in an erect poſition of the body, and in an exerciſe which puſhes the blood into the depending veſſels, while at the ſame time the effects of theſe circumſtances are much favoured by the abundance and laxity of the cellular texture about the anus. It is to be particularly obſerved, that when an hæmorrhoidal affection has either been originally or has become a diſeaſe of the ſyſtem, it then acquires a particular connection with the ſtomach; ſo that certain affections of the ſtomach excite the hæmorrhoidal diſeaſe, and certain ſtates of this diſeaſe excite the diſorders of the ſtomach.

It has been an almoſt univerſally received opinion, that the hæmorrhoidal flux is a ſalutary evacuation, which prevents many diſeaſes that would otherwiſe have happened; and that it even contributes to give long life: and as this opinion has been ſtrenuouſly adopted by Dr Stahl, it has had a very conſiderable influence on the practice of phyſic in Germany. But Dr Cullen maintains that we can never expect to reap much benefit from this flux, which at firſt is purely topical; and, granting that it ſhould become habitual, it is never, he thinks, proper to be encouraged. It is a diſagreeable diſeaſe; ready to go to exceſs, and thereby to prove hurtful and ſometimes, even fatal. At beſt it is liable to accidents, and thus to unhappy conſequences. He is therefore of opinion, that even the firſt approaches of the diſeaſe are to be guarded againſt; and that, though it ſhould have proceeded for ſome time, it ought always to be moderated, and the neceſſity of it ſuperſeded.

Cure. The general intentions of cure in caſes of hæmorrhois are much varied, according to the circumſtances of the affection at the time. When hæmorrhois exiſts in the ſtate of tumor, the principal objects are to counteract inflammation, and to promote a diſcharge of blood from the part. When it is in the ſtate of evacuation, the chief intentions of cure are, to diminiſh the impetus of blood at the part affected, and to increaſe the reſiſtance to the paſſage of blood through the ruptured veſſels. And finally, when the diſeaſe exiſts in the ſtate of ſuppreſſion, the aims of the practitioner muſt chiefly be, to obviate the particular affections which are induced in conſequence of the ſuppreſſion; to reſtore the diſcharge, as a means of mitigating theſe and preventing others; or when the diſcharge cannot with propriety or advantage be reſtored, to compenſate the want of it by vicarious evacuations.

With theſe various intentions in different caſes, a variety of different remedies may be employed with advantage.

When any evident cauſe for this diſeaſe is perceived, we ought immediately to attempt a removal of that cauſe. One of the moſt frequent remote cauſes is an habitual coſtiveneſs; which muſt be obviated by a proper diet, ſuch as the perſon's own experience will beſt direct; or if the management of diet be not effectual, the belly muſt be kept open by medicines, which may prove gently laxative, without irritating the rectum. In moſt caſes it will be of advantage to acquire a habit with regard to the time of diſcharge, and to obſerve it exactly. Another cauſe of the hæmorrhois to be eſpecially attended to is the prolapſus ani, which is apt to happen on a perſon's having a ſtool. If this ſhall occur to any conſiderable degree, and be not at the ſame time eaſily and immediately replaced, it moſt certainly produces piles, or increaſes them when otherwiſe produced. Perſons therefore who are liable to this prolapſus, ſhould, after having been at ſtool, take great pains to have the inteſtine immediately replaced, by lying down in an horizontal poſture, and preſſing gently upon the anus, till the reduction ſhall be completely obtained. When this prolapſus is occaſioned only by the voiding of hard and bulky fæces, it is to be removed by obviating the coſtiveneſs which occaſions it. But in ſome perſons it is owing to a laxity of the rectum; and in thoſe it is often moſt conſiderable on occaſion of a looſe ſtool. In theſe caſes, it is to be treated by aſtringents, and proper artifices are to be employed to keep the gut in its place.

When the diſeaſe has frequently recurred from neglect, and is thus in ſome meaſure eſtabliſhed, the methods abovementioned are no leſs proper; but in this caſe ſome other meaſures muſt alſo be uſed. It is eſpecially proper to guard againſt a plethoric ſtate of the body; and therefore to avoid a ſedentary life, full diet, and intemperance in the uſe of ſtrong liquor, which in all caſes of hæmorrhagy is of the moſt pernicious conſequence.

Exerciſe of all kinds is of great ſervice in obviating and removing a plethoric ſtate of the body; but upon occaſion of the hæmorrhoidal flux, when this is immediately to come on, both walking and riding, as increaſing the determination of the blood into the hæmorrhoidal veſſels, are to be avoided. At other times, when no ſuch determination is already formed, theſe modes of exerciſe may be very properly employed.

Another method of removing plethora is by cold bathing; but this muſt be employed with caution. When the hæmorrhoidal flux is approaching, it may be dangerous to divert it; but during the intervals of the diſeaſe cold bathing may be employed with ſafety and advantage; and in thoſe who are liable to a prolapſus ani, the frequent waſhing of the anus with cold-water may be uſeful.

Beſides general antiphlogiſtic regimen, in ſome caſes where the inflammation runs high, recourſe may be had with great advantage both to general blood-letting and to leeches applied at the anus. Relief is alſo often obtained from the external application of emollients, either alone or combined with different articles of the ſedative kind, as acetated ceruſe or opium, by which it is well known that pain in general, particularly when depending on increaſed ſenſibility, or augmented action of the veſſels, is powerfully allayed.

When the flux has actually come on, we are to moderate it as much as poſſible, by cauſing the patient to lie in a horizontal poſture on a hard bed; by avoiding exerciſe in an erect poſture, uſing a cool diet, and avoiding external heat. But with reſpect to the further cure of this diſeaſe, we muſt obſerve, that there are only two caſes in which it is common for hæmorrhoidal perſons to call for medical aſſiſtance. The one is, when the affection is accompanied with much pain; and the other, when the piles are accompanied with exceſſive bleeding. In the firſt caſe, we muſt conſider whether the piles be external or internal. The pain of the external piles happens eſpecially when a conſiderable protruſion of the rectum has taken place; and while it remains unreduced, it is ſtrangled by the conſtriction of the ſphincter; and at the ſame time no bleeding happens to take off the ſwelling of the protruded portion of the inteſtine; and ſometimes an inflammation ſupervenes, which greatly aggravates the pain. In this caſe, emollient fomentations and poultices are ſometimes of ſervice, but the application of leeches is generally to be preferred.

In caſe of exceſſive bleeding, we are on all occaſions to endeavour to moderate the flux, even where the diſeaſe has occurred as a critical diſcharge; for if the primary diſeaſe ſhall be entirely and radically cured, the preventing any return of the hæmorrhois ſeems perfectly ſafe and proper. It is only when the diſeaſe ariſes from a plethoric habit, and from a ſtagnation of blood in the hypochondriac region, or when, though originally topical, it has by frequent repetition become habitual and has thereby acquired a connection with the ſyſtem, that any doubt can ariſe about curing it entirely. In any of theſe caſes, however, Dr Cullen is of opinion that it will be proper to moderate the bleeding, leſt, by its continuance or repetition, the plethoric ſtate of the body, and the particular determination of the blood into the hæmorrhoidal veſſels, be increaſed, and the return of the diſeaſe be too much favoured. Dr Stahl is of opinion, that the hæmorrhoidal flux is never to be accounted exceſſive excepting when it occaſions great debility or leucophlegmatia: but Dr Cullen thinks, that the ſmalleſt approach towards producing either of theſe effects ſhould be conſidered as an exceſs which ought to be prevented from going farther; and even in the caſes of congeſtion and plethora, if the plethoric habit and tendency can be obviated and removed, the hæmorrhoidal flux may then with ſafety be entirely ſuppreſſed. In all caſes therefore of exceſſive bleeding, or any approach to it, aſtringents both internal and external may be ſafely and properly applied; not indeed to induce an immediate and total ſuppreſſion; but to moderate the hæmorrhagy, and by degrees to ſuppreſs it altogether; while at the ſame time meaſures are to be taken for the removing the neceſſity of its recurrence.

245 GENUS XXXIX. MENORRHAGIA.

Immoderate Flow of the MENSES.

Menorrhagia, *Sauv* 244. *Lin.* 202. *Vog.* 96.
Metrorrhagia, *Sag.* gen. 179.
Uteri hæmorrhagia, *Hoffm.* II. 224.
Hæmorrhagia uterina, *Junck.* 14.
Leucorrhœa, *Sauv.* gen. 267. *Lin.* 201. *Vog.* 119. *Sag.* gen. 202.
  Cachexia uterino, ſive fluor albus, *Hoffm.* III. 348.
  Fluor albus, *Junck* 133.
Abortus, *Sauv.* gen. 245. *Lin.* 204. *Sag.* gen. 180. *Junck.* 92.
Abortio, *Vog.* 97.
  Fluor uterini ſanguinis, *Boerh.* 1303.
  Convulſio uteri, ſive abortus, *Hoffm.* III. 176.

246 Sp. I. The *Immoderate Flow* of the MENSES, properly ſo called.

Menorrhagia rubra, *Cul.*
Menorrhagia immodica, *Sauv.* ſp. 3.
Menorrhagia ſtillatitia, *Sauv.* ſp. 2.

Deſcription. The quantity of the menſtrual flux is different in different women, and likewiſe in the ſame woman at different times. An unuſual quantity therefore is not always to be conſidered as morbid: but when a large flow of the menſes has been preceded by headach, giddineſs or dyſpnœa; has been uſhered in by a cold ſtage, and is attended with much pain of the back and loins, with a frequent pulſe, heat and thirſt; it may then be conſidered as preternaturally morbid. On the other hand, when the face becomes pale, the pulſe weak, an uſual debility is felt in exerciſe, and the breathing is hurried by little labour; when the back becomes pained from any continuance in an erect poſture, when the extremities become frequently cold, and when at night the feet appear affected with œdematous ſwelling: from all theſe ſymptoms we may conclude, that the flow of the menſes has been immoderate, and has already induced a dangerous ſtate of debility. The debility, induced in this caſe, often appears alſo by affections of the ſtomach, an anorexia, and other ſymptoms of dyſpepſia; by a palpitation of the heart, and frequent faintings; by a weakneſs of mind, liable to ſtrong emotions from ſlight cauſes, eſpecially thoſe preſented by ſurpriſe. A large flow of the menſes attended with barrenneſs in married women, may generally be conſidered as preternatural and morbid. Generally, alſo, that flow of the menſes may be conſidered as immoderate, which is preceded and followed by a leucorrhœa.

Cauſes, &c. The proximate cauſe of the menorrhagia is either the effort of the uterine veſſels preternaturally increaſed, or a preternatural laxity of the extremities of the uterine arteries.—The remote cauſes may be, 1. Thoſe which increaſe the plethoric ſtate of the uterine veſſels; as a full and nouriſhing diet, much ſtrong liquor, and frequent intoxications. 2. Thoſe which determine the blood more copiouſly and forcibly into the uterine veſſels; as violent ſtrainings of the whole body; violent ſhocks from falls; ſtrokes or contuſions on the lower belly; violent exerciſe, particularly in dancing; and violent paſſions of the mind. 3. Thoſe which particularly irritate the veſſels of the uterus; as exceſs in venery; the exerciſe of venery in the time of menſtruation; a coſtive habit, giving occaſion to violent ſtraining at ſtool; and cold applied to the feet. 4. Thoſe which have forcibly overſtrained the extremities of the uterine veſſels; as frequent abortions, frequent child-bearing without nurſing, and difficult or tedious labours. Or, laſtly, thoſe which induce a general laxity; as living much in warm chambers, and drinking much of warm enervating liquors, ſuch as tea, coffee, &c.

Cure. The treatment and cure of the menorrhagia, muſt be different according to the different cauſes of the diſeaſe. The practices employed, however, are chiefly uſed with one or two intentions; either with the view of reſtrianing the diſcharge when preſent, or of preventing the return of an exceſſive diſcharge at the ſucceeding period. The firſt is chiefly to be accompliſhed by employing ſuch practices as diminiſh the force occaſioning the diſcharge of blood, or as augment the reſiſtance to its paſſage through the veſſels by which it is to be diſcharged. The laſt is in ſome degree to be obtained by avoiding cauſes which either increaſe the general impetus of the blood, or the impetus at the uterus in particular; but principally by giving additional vigour to the uterine veſſels.

In all caſes, the firſt attention ought to be given to avoiding the remote cauſes, whenever that can be done; and by ſuch attention the diſeaſe may be often entirely cured. When the remote cauſes cannot be avoided, or when the avoiding them has been neglected, aud a copious menſtruation has come on, it ſhould be moderated as much as poſſible, by abſtaining from all exerciſe at the coming on or during the continuance of the menſtruation; by avoiding even an erect poſture as much as poſſible; by ſhunning external heat, and of courſe warm chambers and ſoft beds; by uſing a light and cool diet; by taking cold drink, at leaſt as far as former habits will allow; by avoiding venery; by obviating coſtiveneſs, or removing it by laxatives which give little ſtimulus. The ſex are commonly negligent, either in avoiding the remote cauſes, or in moderating the firſt beginnings of this diſeaſe. It is by ſuch neglect that it ſo frequently becomes violent and of difficult cure; and the frequent repetition of a copious menſtruation may be conſidered as a cauſe of great laxity in the extreme veſſels of the uterus.

When the coming on of the menſtruation has been preceded by ſome diſorder in other parts of the body, and is accompanied with pains of the back, ſomewhat like parturient pains, with febrile ſymptoms, and when at the ſame time the flow ſeems to be copious, a bleeding at the arm may be proper, but is not often neceſſary; and it will in moſt caſes be ſufficient to employ, with great attention and diligence, thoſe means already mentioned for moderating the diſcharge.

When the immoderate flow of the menſes ſhall ſeem to to be owing to a laxity of the veſſels of the uterus, as may be concluded from the general debility and laxity of the perſon's habit; from the remote cauſes that have occaſioned the diſeaſe; from the abſence of the ſymptoms which denote increaſed action in the veſſels of the uterus; from the frequent recurrence of the diſeaſe; and particularly from this, that the female in the intervals of menſtruation is liable to a leucorrhœa: in ſuch a caſe, the diſeaſe is to be treated, not only by employing all the means abovementioned for moderating the hemorrhagy, but alſo by avoiding all irritation, every irritation having a greater effect in proportion as the veſſels are more lax and yielding. If, in ſuch a caſe of laxity, it ſhall appear that ſome degree of irritation concurs, opiates may be employed to moderate the diſcharge; but in uſing theſe much caution is requiſite. If, notwithſtanding theſe meaſures having been taken, the diſcharge ſhall prove very large, aſtringents both external and internal may be employed. In ſuch caſes, Dr Cullen aſks, May ſmall doſes of emetics be of ſervice?

When the menorrhagia depends on the laxity of the uterine veſſels, it will be proper, in the intervals of menſtruation, to employ tonic remedies; as cold bathing and chalybeates. The exerciſes of geſtation alſo may be very uſeful, both for ſtrengthening the whole ſyſtem, and for taking off the determination of the blood to the internal parts.

Theſe remedies may be employed in all caſes of menorrhagia, from whatever cauſe it may have proceeded, it ſhall have already induced a conſiderable degree of debility in the body.

247 Sp. II. Abortion.

Menorrhagia abortus, *Cul.*
Menorrhagia gravidarum, *Sauv.* ſp. 6.
Abortus effluxio, *Sauv.* ſp. 1.
  a. Abortus ſubtrimeſtris.
  b. Abortus ſubſemeſtris.
  c. Abortus octimeſtris.
Abortus ab uteri laxitate, *Sauv.* ſp. 2.

248 Sp. III. *Immoderate Flux* of the Lochia.

Menorrhagia lochialis, *Sauv.* ſp. 8 *Cul.*

For the deſcription, treatment and cure, of theſe two laſt diſeaſes, ſee the article Midwifery.

249 Sp. IV. *Immoderate Flow* of the Menses from ſome Local Diſorder.

Menorrhagia vitiorum, *Cul.*
Menorrhagia ex hyſteroptoſi, *Sauv.* Sp. 5.
Menorrhagia ulceroſa, *Sauv.* ſp. 9.

250 Sp. V. The *Leucorrhœa, Fluor Albus*, or *Whites.*

Menorrhagia alba, *Cul.*
Leucorrhœa, *Sauv.* G 267.
Menorrhagia decolor, *Sauv.* ſp. 7
Leucorrhœa Americana *Sauv.* ſp. 5.
Leucorrhœa Indica, *Sauv.* ſp. 6.
Leucorrhœa Nabothi, *Sauv.* ſp. 9.
Leucorrhœa gravidarum, *Sauv.* ſp. 8.

Deſcription. The *fluor albus*, female weakneſs, or *whites*, as it is commonly called, is a diſeaſe of the womb and its contiguous parts; from which a pale coloured, greeniſh, or yellow fluid, is diſcharged, attended with loſs of ſtrength, pain in the loins, bad digeſtion, and a wan ſickly aſpect.

Cauſes, &c. The quantity, colour, and conſiſtence of the diſcharge, chiefly depend upon the time of its duration, the patient's habit of body, and the nature of the cauſe by which it was produced. Taking cold, ſtrong liquor, immoderate heat and moiſture, or violent exerciſe, are all obſerved to produce a bad effect, as to its quantity and quality.

Weakly women of lax ſolids, who have had many children, and long laboured under ill health, are of all the moſt ſubject to this diſagreeable diſeaſe; from which they unfortunately ſuffer more ſevere penance than others, as the niceſt ſenſations are often connected with ſuch a delicacy of bodily frame as ſubjects them to it.

In Holland it is very frequent and in a manner peculiar to the place, from the dampneſs of its ſituation; the ſurrounding air being ſo overcharged with moiſture as to relax the body, ſtop perſpiration, and throw it upon the bowels or womb; producing in the firſt a diarrhœa or flux, in the laſt the *fluor albus* or female weakneſs.

The diſcharge often proceeds from the veſſels ſubſervient to menſtruation; becauſe, in delicate habits, where thoſe veſſels are weak, and conſequently remain too long uncontracted, the *fluor albus* ſometimes immediately follows the menſes, and goes off by degrees as they gradually cloſe. It alſo comes from the mucous glands of the womb, as is particularly evident in very young females of eight and ten years old; in whom, though very rarely, it has been obſerved, and where it muſt then have neceſſarily eſcaped from thoſe parts, as the uterine veſſels are not ſufficiently enlarged for its paſſage at ſo early a period.

Sometimes, as in women with child, it proceeds from the paſſage to the womb, and not from the womb itſelf; which, during pregnancy, is cloſely ſealed up, ſo that nothing can paſs from thence till the time of labour. The application of thoſe inſtruments called *peſſaries*, from the pain and irritation they occaſion, are alſo apt to bring on this diſcharge. Hence we may conclude, that this diſeaſe may happen although the blood be in a pure ſtate. Here the fault ſeems to be placed in the veſſels at the part, by which the fluids are vitiated and changed from their natural qualities.

The *fluor albus* has been ſuppoſed to ſupply the want of the menſes; becauſe where the firſt prevails, the laſt is generally either irregular or totally wanting: but it might more properly be ſaid, that the preſence of the *fluor albus*, which is a preternatural evacuation, occaſions the abſence of that which is natural; as is evident from the return of the menſes after the *fluor albus* has been cured. Indeed, when this diſcharge appears about the age of 13 or 14, and returns once a month, with ſymptoms like thoſe of the menſes, then it may be deemed ſtrictly natural, and therefore ought not to be ſtopped.

Prognoſis. The *fluor albus* may be diſtinguiſhed into two kinds. The firſt ariſes from a ſimple weakneſs, or the relaxation of the ſolids; which may either be *general*, where the whole bodily ſyſtem is enervated and unſtrung; or *partial*, where the womb only is thus affected, Hæmorrhagiæ

affected in conſequence of hard labour, frequent miſcarriages, a ſuppreſſion or immoderate quantity of the menſes, or a ſprain of the back or loins,

In the firſt caſe, the diſcharge being generally mild, may be ſafely taken away. In the ſecond it may proceed from a vitiated or impure blood, where the body from thence, is loaded with groſs humours, which nature for her own ſecurity and relief thus endeavours to carry off. In ſuch caſes, the diſcharge is often of a reddiſh colour, like that from old ulcerous ſores; being ſometimes ſo ſharp as to excoriate the contiguous parts, and occaſion a ſmarting and heat of urine.

A deep-ſeated, darting pain, with a forcing down, attending ſuch a diſcharge, is a very dangerous and alarming ſign, and indicates an ulceration or cancerous ſtate of the womb. This malignant ſtate of the diſeaſe, if of long continuance, is extremely difficult of cure; and diſpoſes the patient to barrenneſs, a bearing down, dropſy, or conſumption.

Cure, &c. The cauſes of thoſe two kinds of this diſeaſe being different, ſo they will require a very different method of cure. For this purpoſe, in the firſt caſe, nothing will be more proper than nouriſhing ſimple food; ſuch as veal broths, jellies, freſh eggs, and milk diet. The acid fruits will alſo be proper; and the patient may take a reſtorative, ſtrengthening infuſion, which will give firmneſs to the body, and aſſiſt the weakened fibres of the womb in returning to their natural ſtate.

The ſame method may be uſed with ſucceſs, where the *fluor albus* follows the menſes as already obſerved.

The Tunbridge or Spa waters may be drank at the ſame time and if neceſſary, an infuſion of green tea, or pure ſmith's forge water, may be uſed with a womb-ſyringe as an injection twice a-day. Should the diſeaſe prove uncommonly obſtinate, the patient may go into the cold bath every ſecond day; and alſo drink lime-water with milk, which will expedite the cure, and prevent a relapſe. Volatile liniment, and afterwards a ſtrengthening plaſter, may be applied to the ſmall of the back.

By way of caution, the female ſhould abſtain from the immoderate uſe of tea; and be removed into a dry clear air; or if ſhe be obliged to remain in one leſs proper, ſhe may apply the fleſh-bruſh, and wear a flannel ſhift next her ſkin, impregnated with the fumes of burning frankincenſe or any of the grateful aromatic gums. Cold ſpring-water pumped on the loins, or a bliſtering plaſter applied to the bottom of the ſpine or back, are both very powerful in their effects, and have ſometimes ſucceeded after other remedies had been tried in vain.

In the ſecond ſort of the diſeaſe, where the diſcharge is ſharp and of long ſtanding, it would be extremely dangerous to ſuppreſs it ſuddenly, either by aſtringents internally taken, or applied as injections, until the ſyſtem be reſtored to a more ſound and vigorous condition.

A purging potion may be taken twice a-week, and in the intervals an alterative pill night and morning. After this courſe has been continued a fortnight or three weeks, ſhe may begin with the ſtrengthening bitter infuſion, or ſome other tonic, in the quantity of a tea-cupful twice a-day, or to a greater extent if the ſtomach will allow.

Leucorrhœa

The ſame ſort of food and regimen will here be proper as in the firſt kind of the diſeaſe. The patient ſhould abſtain from malt liquors, and drink rice-water. in each pint of which half an ounce of gum-arabic has been diſſolved; or if ſhe be weak, and of a cold bloated habit of body, a little French brandy may be added occaſionally.

When ſhe begins to take the bitter infuſion, it will be proper to uſe the Tunbridge or Pyrmont water for common drink; but if thoſe cannot conveniently be had, the *artificial aërated water*, impregnated with iron and fixed air, will make an excellent ſubſtitute. If it ſhould render her coſtive, and occaſion head-ach, ſhe may deſiſt, and drink imperial water or a little ſenna-tea ſweetened with manna, till thoſe complaints be removed.

In ſhort, as this is a malady of the moſt diſagreeable kind, which by long continuance or neglect becomes difficult of cure and often produces an *ulceration of the womb, bearing down, barrenneſs*, a *dropſy*, or *conſumption;* it were to be wiſhed that women, on ſuch occaſions, would be more attentive to their own ſafety, by uſing all poſſible means, in due time, to prevent thoſe diſorders.

Dr Leake ſays he has attended more patients labouring under the *fluor albus* in the autumn than at any other ſeaſon of the year, eſpecially when the weather was uncommonly moiſt and cold: moſt of them were cured by change of diet, an increaſed perſpiration, and the proper uſe of Peruvian bark with aromatics. He obſerved, that ſeveral about this time who eſcaped the diſorder, were viſited with bad colds, a defluxion on the throat, or a diarrhœa, which were removed by a ſimilar treatment.

As women are ſometimes connected with thoſe who do not conſcientiouſly regard their ſafety, it is a circumſtance of the utmoſt conſequence *to diſtinguiſh a freſh venereal infection from the fluor albus or whites:* for if the firſt be miſtaken for the laſt, and be either neglected or improperly treated, the worſt conſequences may ariſe.

The following ſigns will beſt inform the patient whether there be occaſion for her doubts or not.

A freſh infection, called *gonorrhœa*, is malignant and inflammatory; the *fluor albus* moſt commonly ariſes from relaxation and bodily weakneſs: and therefore the remedies proper in the firſt diſorder would render the laſt more violent, by locking up and confining the infectious matter.

In the gonorrhœa, the diſcharge chiefly proceeds from the parts contiguous to the urinary paſſage, and continues whilſt the menſes flow but in the *fluor albus* it is ſupplied from the cavity of the womb and its paſſage, and then the menſes are ſeldom regular.

In the gonorrhœa, an itching, inflammation, and heat of urine, are the fore-runners of the diſcharge; the orifice of the urinary paſſage is prominent and painful, and the patient is affected with a frequent irritation to make water. In the *fluor albus*, pains in the loins, and loſs of ſtrength, attend the diſcharge; and if any inflammation or heat of urine follow, they happen in a leſs degree, and only after a long continuance of the diſcharge, which, becoming ſharp and acrimonious, excoriates the ſurrounding parts.

In the gonorrhœa, the diſcharge ſuddenly appears without any evident cauſe; but in the *fluor albus*, it comes on more ſlowly, and is often produced by irregularities of the menſes, frequent abortion, ſprains, or long-continued illneſs.

In the gonorrhœa, the diſcharge is greeniſh or yellow, leſs in quantity, *and not attended with the ſame ſymptoms of weakneſs*. In the *fluor albus*, it is alſo often of the ſame colour, eſpecially in bad habits of body, and after long continuance; but is uſually more offenſive, and redundant in quantity.

All the other kinds of hemorrhagy enumerated by medical writers, are by Dr Cullen reckoned to be ſymptomatic; as,

Stomacace, *Sauv.* gen. 241. *Lin.* 175. *Vog.* 85. *Sag.* gen. 176.

Species: Scorbutica, Purulenta, &c.

Hæmatemesis, *Sauv.* gen. 242. *Lin.* 184. *Vog.* 89. gen. 177.

Species: Plethorica, Catamenialis, Scorbutica, &c.

Hæmaturia, *Sauv.* gen. 233. *Lin.* 198. *Vog.* 92. *Sag.* gen. 178.

Species: Purulenta, Calculoſa, Hæmorrhoidalis, &c.

Order V. PROFLUVIA.

251 Genus XL. CATARRHUS.
The Catarrh.

Catarrhus, *Sauv.* gen. 186. *Vog.* 98. *Sag.* gen. 145.
Coryza, *Lin.* 174. *Vog.* 100. *Sag.* gen. 196.
Rheuma, *Sauv.* gen. 142.
Tuſſis, *Sauv.* gen 142. *Lin*, 155. *Vog.* 205. *Sag.* gen. 245. 255. *Junck.* 30.
Tuſſis catarrhalis et rheumatica, *Hoffm.* III. 109.

252 Sp. I. *Catarrh* from Cold

Catarrhus a frigore, *Cul.*
Catarrhus benignus, *Sauv.* ſp. 1.
Catarrhus pectoreus, *Sauv.* ſp. 6.
Coryza catarrhalis, *Sauv.* ſp. 1.
Coryza phlegmatorrhagia, *Sauv.* ſp. 2. *Salmuth.* Obſ. cent. 1. 37. *Junck.* 28. *Morgagn.* de ſed. xiv. 21.
Coryza febricoſa, *Sauv.* ſp. 6.
Tuſſis catarrhalis, *Sauv.* ſp. 1. *N. Roſen* Diſſ. apud *Haller*, Diſput, Pract. tom. II.
Rheuma catarrhale, *Sauv.* ſp. 1.
Amphimerina catarrhalis, *Sauv.* ſp. 2.
Amphimerina tuſſiculoſa, *Sauv.* ſp. 13.
Cephalalgia catarrhalis, *Sauv.* ſp. 10.

253 Sp. II. *Catarrh* from Contagion.

Catarrhus a contagio, *Cul.*
Catarrhus epidemicus, *Sauv.* ſp. 3.
Rheuma epidemicum, *Sauv.* ſp. 2.
Synocha catarrhalis, *Sauv.* ſp. 5.

There are ſeveral ſymptomatic ſpecies: as, Catarrhus Rubeoloſus;] Tuſſis Varioloſa, Verminoſa, Calculoſa, Phthiſica, Hyſterica, a dentitione, Gravidarum, Metallicolarum, &c.

Deſcription. The catarrh is an increaſed excretion of mucus from the mucous membrane of the noſe, fauces, and bronchiæ, attended with pyrexia.

Practical writers and noſologiſts have diſtinguiſhed the diſeaſe by different appellations, according as it appears to affect different parts of the mucous membrane, one part more or leſs than the other: but Dr Cullen is of opinion that the diſeaſe in thoſe different parts is always of the ſame nature, and proceeds from the ſame cauſe in the one as in the other. Very commonly indeed thoſe different parts are affected at the ſame time; and therefore there is little room for the diſtinction mentioned. The diſeaſe has been frequently treated of under the title of *tuſſis* or *cough*; and a cough, indeed, always attends the chief form of catarrh, that is, the increaſed excretion from the bronchiæ; but as it is ſo often alſo a ſymptom of many other affections, which are very different from one another, it is improperly uſed as a generic title.

The diſeaſe generally begins with ſome difficulty of breathing through the noſe, and with a ſenſe of ſome fulneſs ſtopping up that paſſage. This again is often attended with ſome dull pain and a ſenſe of weight in the forehead, as well as a ſtiffneſs in the motion of the eyes. Theſe feelings, ſometimes at their very firſt beginning, and always ſoon after, are attended with the diſtillation of a thin fluid from the noſe, and ſometimes from the eyes; and theſe fluids are often found to be ſomewhat acrid, both by their taſte and by their fretting the parts over which they paſs. Theſe ſymptoms conſtitute the coryza and gravedo of authors, and are commonly attended with a ſenſe of laſſitude over the whole body. Sometimes cold ſhiverings are felt; at leaſt the body is more ſenſible than uſual to the coldneſs of the air; and with all this the pulſe is more frequent than ordinary, eſpecially in the evenings.

Theſe ſymptoms have ſeldom continued long before they are accompanied with ſome hoarſeneſs, and a ſenſe of roughneſs and ſoreneſs in the trachea, with ſome difficulty of breathing, expreſſed by a ſenſe of ſtraitneſs in the cheſt, and with a cough which ſeems to ariſe from ſome irritation felt at the glottis. This cough is generally at firſt dry and painful, occaſioning pains about the cheſt, and more eſpecially in the breaſt; ſometimes, together with theſe ſymptoms, pains reſembling thoſe of the rheumatiſm are felt in ſeveral parts of the body, particularly about the neck and head. With all theſe ſymptoms, the appetite is impaired, ſome thirſt ariſes, and a feveriſh laſſitude is felt all over the body. Theſe ſymptoms, mark the height and violence of the diſeaſe; but commonly it does not continue long. By degrees the cough comes to be attended with a more copious excretion of mucus; which is at firſt thin, but gradually becoming thicker, is brought up with leſs frequent and leſs laborious coughing. The hoarſeneſs and ſoreneſs of the treachea are alſo relieved or removed; and the febrile ſymptoms abating, the expectoration becomes again leſs, and the cough leſs frequent, till at length they ceaſe altogether.

Such is generally the courſe of this diſeaſe, neither tedious nor dangerous; but it is ſometimes in both reſpects otherwiſe. The body affected with catarrh ſeems to be more than uſually liable to be affected by cold air; and upon expoſure of the body to freſh cold, the diſeaſe, which ſeemed to be yielding, is often brought back with greater violence than before, and is rendered not only more tedious than otherwiſe it would be, but alſo more dangerous by the ſupervening of other diſeaſes. Some degree of the cynanche tonſillaris often accompanies the catarrh; and when this is aggravated by a freſh application of cold, the cynanche alſo becomes more violent and dangerous from the cough, which is preſent at the ſame time. When a catarrh has been occaſioned by a voilent cauſe, when it has been aggravated by improper management, and eſpecially when it has been rendered more violent by freſh and repeated applications of cold, it often paſſes into a pneumonic inflammation, attended with the utmoſt danger.

Unleſs, however, ſuch accidents as thoſe happen, a catarrh, in ſound perſons not far advanced in life, is always a ſlight and ſafe diſeaſe; but, in perſons of a phthiſical diſpoſition, a catarrh may readily produce a hemoptyſis, or perhaps form tubercles in the lungs; and ſtill more readily in perſons who have tubercles already formed in the lungs, an accidental catarrh may occaſion the inflammation of theſe tubercles, and in conſequence produce a phthiſis pulmonalis.

In elderly perſons, a catarrh ſometimes proves a dangerous diſeaſe. Many perſons, as they advance in life, and eſpecially after they have arrived at old age, have the natural mucus of the lungs poured out in greater quantity, and requiring a frequent expectoration. If, therefore, a catarrh happen to ſuch perſons, and increaſe the afflux of fluids to the lungs, with ſome degree of inflammation, it may produce the peripneumonia notha, or more properly chronic catarrh, a diſeaſe continuing often for many years, or at leaſt regularly every winter; which in ſuch caſes is very often fatal.

Cauſes, &c. The proximate cauſe of catarrh ſeems to be an increaſed afflux of fluids to the mucous membrane of the noſe, fauces, and bronchiæ, along with ſome degree of inflammation affecting the ſame. The latter circumſtance is confirmed by this, that, in the caſe of catarrh, the blood drawn from a vein commonly exhibits the ſame inflammatory cruſt which appears in the caſe of phlegmaſiæ. The remote cauſe of catarrh is moſt commonly cold applied to the body. This application of cold producing catarrh is generally evident and obſerved; and Dr Cullen is of opinion that it would always be ſo, were men acquainted with and attentive to the circumſtances which determine cold to act upon the body.

The application of cold which occaſions a catarrh, probably operates by ſtopping the perſpiration uſually made by the ſkin, and which is therefore determined to the mucous membrane of the parts abovementioned. As a part of the weight which the body daily loſes by inſenſible evacuation, is owing to an exhalation from the lungs, there is probably a connection between this exhalation and the cutaneous perſpiration, ſo that the one may be increaſed according as the other is diminiſhed; and therefore we may underſtand how the diminution of cutaneous perſpiration, by the application of cold, may increaſe the afflux of fluids to the lungs, and thereby produce a catarrh.

Dr Cullen obſerves that there are ſome obſervations of Dr James Keil which may render this matter doubtful; but ſays there is a fallacy in thoſe obſervations. The evident effects of cold in producing coryza, leave the matter, in general, without doubt; and there are ſeveral other obſervations which ſhow a connexion between the lungs and the ſurface of the body.

Whether from the ſuppreſſion of perſpiration, a catarrh be produced merely by an increaſed afflux of fluids, or whether in addition to this the matter of perſpiration be at the ſame time determined to the mucous glands, and there excites a particular irritation, may be uncertain; but Dr Cullen thinks the latter ſuppoſition is moſt probable.

Although in the caſe of a common catarrh, which is in many inſtances ſporadic, it may be doubtful whether any morbific matter be applied to the mucous glands; we are, however, certain that the ſymptoms of a catarrh do frequently depend upon ſuch a matter being applied to theſe glands, as appears from the caſe of meaſles, chincough, and eſpecially from the frequent occurrence of contagious and epidemical catarrh.

The phenomena of contagious catarrhs have been much the ſame with thoſe of the others; and the diſeaſe has always been particularly remarkable for this, that it has been the moſt widely and generally ſpreading epidemic known. It has ſeldom appeared in any one country of Europe, without appearing ſucceſſively in almoſt every different part of it; and, in ſome inſtances, it has been alſo transferred to America, and has been ſpread there in like manner, ſo far as we have had opportunities of being informed.

The catarrh from contagion appears with nearly the ſame ſymptoms as thoſe abovementioned. It ſeems often to come on in conſequence of the application of cold. And indeed catarrh from cold and contagion are in every reſpect ſo ſimilar, that when this epidemic rages, it is impoſſible to determine with a perſon having ſymptoms of catarrh after expoſure to cold, whether the diſeaſe proceeds from the one cauſe or the other. In moſt inſtances, however, catarrh from contagion comes on with more cold ſhivering than the catarrh ariſing from cold alone; and the former does alſo not only ſooner ſhow febrile ſpmptoms, but to a more conſiderable degree. Accordingly, it more ſpeedily runs its courſe, which is commonly finiſhed in a few days. It ſometimes ends by a ſpontaneous ſweat; and this, in ſome perſons, produces a miliary eruption. It is, however, the febrile ſtate of this diſeaſe eſpecially that is finiſhed in a few days; for the cough and other catarrhal ſymptoms do frequently continue longer, and often when they appear to be going off they are renewed by any freſh application of cold.

Prognoſis. Conſidering the number of perſons who are affected with catarrh, of either the one ſpecies or the other, and eſcape from it quickly without any hurt, it may be allowed to be a diſeaſe commonly free from danger; but it is not always to be treated as ſuch, for in ſome perſons it is accompanied with pneumonic inflammation. In the phthiſically diſpoſed, it often accelerates the coming on of phthiſis; and in elderly perſons it often proves fatal in the manner we have explained above, viz. by degenerating into its chronic ſtate. But though chronic catarrh be often the termination of that ſpecies which ariſes from cold, we have not, in any caſe, obſerved it to ariſe as a conſequence of a catarrh from contagion. This ſpecies of catarrh, however, is not unfrequently followed by phthiſis; or rather where a phthiſical tendency before exiſted, the affection has been begun and its progreſs accelerated from this cauſe.

Cure. The cure of catarrh is nearly the ſame, whether it proceeds from cold or contagion; only in the latter caſe remedies are commonly more neceſſary than in the former. In the caſes of a moderate diſeaſe, it is commonly ſufficient to avoid cold, or to abſtain from animal-food for ſome days. In ſome caſes, where the febrile ſymptoms are conſiderable, it is proper for that length of time to lie a-bed, and, by taking frequently ſome mild and diluent drink, a little warmed, to promote a very gentle ſweat; and after this to take care to return very gradually only to the uſe of the free air. When the diſeaſe is more violent, not only the antiphlogiſtic regimen, exactly obſerved, but various remedies alſo, become neceſſary. To take off the phlogiſtic diatheſis which always attends this diſeaſe, blood-letting, more or leſs, according as the ſymptoms ſhall require, is the proper remedy. After blood-letting, for reſtoring the determination of the fluids to the ſurface of the body, and at the ſame time for expediting the ſecretion of mucus in the lungs, which may take off the inflammation of its membrane, vomiting is the moſt effectual means. For the laſt-mentioned purpoſe, it has been ſuppoſed that ſquills, gum-ammoniac, the volatile alkali, and ſome other medicines, might be uſeful; but their efficacy has never been found conſiderable: and if ſquills have ever been very uſeful, it ſeems to have been rather by their emetic than by their expectorant powers. When the inflammatory affections of the lungs ſeem to be conſiderable, it is proper, beſides blood-letting, to apply bliſters to the back or ſides.

As a cough is often the moſt troubleſome circumſtance of this diſeaſe, ſo demulcents may be employed to alleviate it. But after the inflammatory ſymptoms are much abated, if the cough ſtill remains, opiates afford the moſt effectual means of relieving it; and, in the circumſtances juſt now mentioned, they may be very ſafely employed. Very conſiderable advantage is often derived from employing opiates in ſuch a manner as to act more immediately on the head of the wind-pipe. For this purpoſe, opium may often be advantageouſly conjoined with demulcents, melting ſlowly in the mouth. And perhaps no form is more convenient, or anſwers the purpoſe better, than the *trochiſci glycyrrhizæ cum opio* of the Edingburgh Pharmacopœia, where purified opium is combined with extract of liquorice, gum Arabic, and other demulcents, to the extent of about a grain in a dram of the compoſition. After the inflammatory and febrile ſtates of this diſeaſe are very much gone, the moſt effectual means of diſcuſſing all remains of the catarrhal affection is by ſome exerciſe of geſtation diligently employed.

Beſides the remedies abovementioned, Mr Mudge, in a treatiſe on this diſeaſe, recommends the ſteam of warm water as a moſt efficacious and ſafe remedy for a catarrh, and which indeed he ſeems to conſider as little leſs than *infallible*. The method of breathing in theſe ſteams is deſcribed under the word INHALER; but he gives a caution to people in health, who may accidentally ſee his machine, not to make the experiment of breathing through cold water with it, or they will be almoſt certain of catching a ſevere cold. His directions for thoſe troubled with the catarrh are as follow:

"In the evening, a little before bed-time, the patient, if of adult age, is to take three drachms, or as many tea-ſpoonfuls, of elixir paregoricum, in a glaſs of water: if the ſubject be younger, for inſtance under five years old, one tea-ſpoonful; or within that and ten years, two. About three quarters of an hour after, the patient ſhould go to bed, and, being covered warm the inhaler three parts filled with water nearly boiling (which, from the coldneſs of the metal, and the time it ordinarily takes before it is to be uſed by the patient, will be of a proper degree of warmth), and being wrapped up in a napkin, but ſo that the valve in the cover is not obſtructed by it, is to be placed at the arm-pit, and the bed-cloathes being drawn up and over it cloſe to the throat, the tube is to be applied to the mouth, and the patient ſhould inſpire and expire through it for about twenty minutes or half an hour.

"It is very evident, as the whole act of reſpiration is performed through the machine, that in inſpiration the lungs will be filled with air which will be hot, and loaded with vapour, by paſſing through the body of water; and in exſpiration, all that was contained in the lungs will, by mixing with the ſteam on the ſurface of the water, be forced thro' the valve in the cover, and ſettle on the ſurface of the body under the bed-cloaths.

"The great uſe of this particular conſtruction of the inhaler is this. Firſt, as there is no neceſſity, at the end of every inſpiration, to remove the tube from the mouth, in order to exſpire from the lungs the vapour which had been received into them, this machine may therefore be uſed with as much eaſe by children as older people. And, ſecondly, as a feveriſh habit frequently accompanies the diſorder, the valve in that reſpect alſo is of the utmoſt importance; for a ſweat, or at leaſt a free perſpiration, not only relieves the patient from the reſtleſs anxiety of a hot, dry, and ſometimes parched ſkin, but is alſo, of all evacuations, the moſt eligible for removing the fever; and it will be generally found, that, after the inhaler ſo conſtructed has been uſed a few minutes, the warm vapour under the cloaths will, by ſettling upon the trunk, produce a ſweat, which will gradually extend itſelf to the legs and feet.

"In a catarrhous fever, or any feveriſh habit attending this cough, it would he proper to take a draught of warm thin whey a few minutes before the inhaler be uſed; and after the proceſs is over, the ſweat which it has produced may be continued by occaſional ſmall draughts of weak warm whey or barley-water. The ſweating is by no means ſo neceſſary to the cure of the catarrhous cough, as that the ſucceſs of the inhaler againſt that complaint at all depends upon it; yet I cannot help once more remarking, that when this diſorder happens to be accompanied with a feveriſh habit, the advantages of this particular conſtruction will be very important.

“ After this reſpiratory proceſs is over, the patient uſually paſſes the night without the leaſt interruption from the cough, and feels no farther moleſtation from it than once or twice in the morning to throw off the trifling leakage which, unperceived, had dripped into the bronchiæ and veſicles during the night; the thinner parts of which being evaporated, what remains is ſoon got rid of with a very gentle effort.

“ I cannot, however, take leave of this part of my ſubject, without pointedly obſerving, that if the patient means not to be diſappointed by my aſſurances or his own expectations, it is eſſentially neceſſary that the following remarks, with regard to the time and manner of uſing this proceſs, ſhould be ſtrictly attended to.

“ Firſt, That as tender valetudinary people are but too well acquainted with the firſt notices of the diſorder, the remedy muſt, or ought to be, uſed the ſame evening; which will, in an ordinary ſeizure, be attended with an immediate cure: but if the ſoreneſs of the reſpiratory organs, or the petulance of the cough, ſhow the cold which has been contracted to have been very ſevere, the inhaler, without the opiate, ſhould be again repeated for the ſame time the next morning.

“ Secondly, if the uſe of the inhaler, &c. be delayed till the ſecond night, it will be always right to repeat it again the next morning without the opiate, but with it if the ſeizure has been violent.

“ And, laſtly, if the cough be of ſome days ſtanding, it will be always neceſſary to employ both parts of the proceſs at night and the ſucceeding morning, as the firſt ſimple inflammatory miſchief is now moſt probably aggravated by an additional one of a chronic tendency.

“ But if, through the want of a timely application or a total neglect of this or any other remedy, the cough ſhould continue to haraſs the patient, it is, particularly in delicate and tender conſtitutions, of the utmoſt conſequence to attempt the removal of it as ſoon as poſſible, before any floating acrimony in the conſtitution (from the perpetual irritation) receives an habitual determination to an organ ſo eſſential to life as the lungs.

“ If the patient expectorate with eaſe and freedom a thick and well-digeſted inoffenſive phlegm, there is generally but little doubt of his ſpitting off the diſorder, with common care, in a few days; and till that be accompliſhed, a proper doſe of elixir paregoricum for a few ſucceſſive nights will be found very uſeful in ſuppreſſing the fatiguing irritation and ineffectual cough, occaſioned by a matter which, dripping in the early ſtate of the diſeaſe into the bronchiæ during the night, is commonly at that time too thin to be diſcharged by thoſe convulſive efforts.

“ If, however, notwithſtanding a free and copious expectoration, the cough ſhould ſtill continue, and the diſcharge, inſtead of removing the complaint, ſhould itſelf, by becoming a diſeaſe, be a greater expence than the conſtitution can well ſupport, it is poſſible than a tender patient may ſpit off his life through a weak, relaxed pair of lungs, without the leaſt appearance of purulence, or any ſuſpicion of ſuppuration. In thoſe circumſtances, beſides, as was mentioned before, increaſing the general perſpiration by the ſalutary friction of a flannel waiſtcoat, change of ſituation, and more eſpecially long journeys on horſeback, conducted as much as poſſible through a thin, ſharp, dry air, will ſeldom fail of removing the complaint.

“ But on the contrary, if the cough ſhould, at the ſame time that it is petulant and fatiguing to the breaſt, continue dry, huſky, and without expectoration; provided there be reaſon to hope that no tubercles are forming, or yet actually formed, there is not perhaps a more efficacious remedy for it than half a drachm of gum ammoniacum, with 18 or 20 drops of liquid laudanum, made into pills, and taken at bedtime, and occaſionally repeated. This excellent remedy Sir John Pringle did me the honour to communicate to me; and I have accordingly found it, in a great many inſtances, amazingly ſucceſsful, and generally very expeditiouſly ſo; for it ſeldom fails to produce an expectoration, and to abate the diſtreſſing fatigue of the cough. In thoſe circumſtances I have likewiſe found the common remedy of ʒſs or ℈ij of *balſ. ſulph. aniſat.* taken twice a-day, in a little powdered ſugar or any other vehicle, a very efficacious one. I have alſo, many times, known a ſalutary revulſion made from the lungs by the ſimple application of a large plaſter, about five or ſix inches diameter, of Burgundy pitch between the ſhoulders; for the perſpirable matter, which is locked up under it, becomes ſo ſharp and acrid, that in a few days it ſeldom fails to produce a very conſiderable itching, ſome little tendency to inflammation, and very frequently a great number of boils. This application ſhould be continued (the plaſter being occaſionally changed), for three weeks or a month, or longer, if the complaint be not ſo ſoon removed.

“ And here I cannot help obſerving, that, though ſeemingly a trifling, it is however by no means a uſeleſs caution to the tender patient, not to expoſe his ſhoulders in bed, and during the night, to the cold; but when he lies down to take care they be kept warm, by drawing the bed-cloathes up cloſe to his back and neck.

“ If, however, notwithſtanding theſe and other means, the cough continuing dry or unattended with a proper expectoration, ſhould perſevere in haraſſing the patient; if, at laſt, it ſhould produce, together with a ſoreneſs, ſhooting pains through the breaſt and between the ſhoulders, attended alſo with ſhortneſs of the breath; and if, added to this, fluſhes of the cheeks after meals, ſcalding in the hands and feet, and other ſymptoms of a hectic, ſhould accompany the diſorder; there is certainly no time to be loſt, as there is the greateſt reaſon to apprehend that ſome acrimony in the habit is determined to the tender ſubſtance of the lungs, and that conſequently tubercular ſuppurations will follow. In this critical and dangerous ſituation, I think I can venture to ſay from long experience, that, accompanied with change of air and occaſional bleedings, the patient will find his greateſt ſecurity in a drain from a large ſcapulary iſſue, aſſiſted by a diet of aſſes milk and vegetables."

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GENUS XLI. DYSENTERIA.
The DYSENTERY.

Dyſenteria, *Sauv.* gen. 248. *Lin.* 191. *Vog.* 107. *Sag.* 183. *Hoffm.* III. 151. *Junck.* 76.

Deſcription. The dyſentery is a diſeaſe in which the patient has frequent ſtools, accompanied with much griping, and followed by a teneſmus. The ſtools, though frequent, are generally in ſmall quantity; and the matter voided is chiefly mucus, ſometimes mixed with blood. At the ſame time, the natural fæces ſeldom appear; and when they do, it is generally in a compact and hardened form, often under the form of ſmall hard ſubſtances known by the name of *ſcybalæ*. This diſeaſe occurs eſpecially in ſummer and autumn, at the ſame time with autumnal intermittent and remittent fevers; and with theſe it is often complicated. It comes on ſometimes with cold ſhiverings, and other ſymptoms of pyrexia; but more commonly the ſymptoms of the topical affection appear firſt. The belly is coſtive, with an unuſual flatulence in the bowels. Sometimes, though more rarely, ſome degree of diarrhœa is the firſt appearance.—In moſt caſes, the diſeaſe begins with griping, and a frequent inclination to go to ſtool. In indulging this, little is voided, but ſome teneſmus attends it. By degrees the ſtools become more frequent, the griping more ſevere, and the teneſmus more conſiderable.—With theſe ſymptoms there is a loſs of appetite, and frequently ſickneſs, nauſea, and vomiting, alſo affecting the patient. At the ſame time there is always more or leſs of pyrexia preſent. It is ſometimes of the remittent kind, and obſerves a tertian period.—Sometimes the pyrexia is manifeſtly inflammatory, and very often of a putrid kind. Theſe febrile ſtates continue to accompany the diſeaſe during its whole courſe, eſpecially when it terminates ſoon in a fatal manner. In other caſes, the febrile ſtate almoſt entirely diſappears, while the proper dyſenteric ſymptoms remain for a long time after. In the courſe in the diſeaſe, whether for a ſhorter or a longer time, the matter voided by ſtool is very various. Sometimes it is merely a mucous matter, without any blood, exhibiting that diſeaſe which is named by ſome the *morbus mucoſus*, and by others the *dyſenteria alba*. For the moſt part, however, the mucus diſcharged is more or leſs mixed with blood. This ſometimes appears only in ſtreaks among the mucus; but at other times is more copious, giving a tinct to the whole; and upon ſome occaſions a pure and unmixed blood is voided in conſiderable quantity. In other reſpects, the matter voided is variouſly changed in colour and conſiſtence, and is commonly of a ſtrong and unuſually fetid odour. It is probable, that ſometimes a genuine pus is voided, and frequently a putrid ſanies, proceeding from gangrenous parts. There are very often mixed with the liquid matter ſome films of a membraneous appearance, and frequently ſome ſmall maſſes of a ſeemingly ſebaceous matter. While the ſtools voiding theſe various matters are, in many inſtances, exceedingly frequent, it is ſeldom that natural fæces appear in them; and when they do appear, it is, as we have ſaid, in the form of ſcybala, that is, in ſomewhat hardened, ſeparate balls. When theſe are voided, whether by the efforts of nature or as ſolicited by art, they procure a remiſſion of all the ſymptoms, and more eſpecially of the frequent ſtools, griping, and teneſmus.

Accompanied with theſe circumſtances, the diſeaſe proceeds for a longer or a ſhorter time. When the pyrexia attending it is of a violent inflammatory kind, and more eſpecially when it is of a very putrid nature, the diſeaſe often terminates fatally in a very few days, with all the marks of a ſupervening gangrene. When the febrile ſtate is more moderate, or diſappears altogether, the diſeaſe is often protracted for weeks, and even for months; but, even then, after a various duration, it often terminates fatally, and generally in conſequence of a return and conſiderable aggravation of the inflammatory and putrid ſtates. In ſome caſes, the diſeaſe ceaſes ſpontaneouſly; the frequency of ſtools, the griping, and teneſmus, gradually diminiſhing, while natural ſtools return. In other caſes, the diſeaſe, with moderate ſymptoms, continues long, and ends in a diarrhœa, ſometimes accompanied with lienteric ſymptoms.

Cauſes, &c. The remote cauſes of this diſeaſe have been variouſly judged of. It generally ariſes in ſummer or autumn, after conſiderable heats have prevailed for ſome time, and eſpecially after very warm and at the ſame time very dry ſtates of the weather; and the diſeaſe is much more frequent in warm than in cooler climates. It happens, therefore, in the ſame circumſtances and ſeaſons which conſiderably affect the ſtate of the bile in the human body: but the cholera is often without any dyſenteric ſymptoms, and copious diſcharges of bile have been found to relieve the ſymptoms of dyſentery; ſo that it is difficult to determine what connection the diſeaſe has with the ſtate of the bile.

It has been obſerved, that the effluvia from very putrid animal-ſubſtances readily affect the alimentary canal, and, upon occaſion, they certainly produce a diarrhœa; but whether they ever produce a genuine dyſentery, is not certain.

The dyſentery does often manifeſtly ariſe from the application of cold, but the diſeaſe is always contagious; and, by the propagation of ſuch contagion, independent of cold, or other exciting cauſes, it becomes epidemic in camps and other places. It is, therefore, to be doubted if the application of cold ever produces the diſeaſe, unleſs where the ſpecific contagion has been previouſly received into the body; and, upon the whole, it is probable that a ſpecific contagion is to be conſidered as being always the remote cauſe of this diſeaſe.

Whether this contagion, like many others, be of a permanent nature, and only ſhows its effects in certain circumſtances which render it active, or if it be occaſionally produced, we cannot determine. Neither, if the latter ſuppoſition be received, can we ſay by what means it may be generated. As little do we know any thing of its nature, conſidered in itſelf; or at moſt, only this, that, in common with many other contagions, it is very often ſomewhat of a putrid nature, and capable of inducing a putreſcent tendency in the human body. This, however, does not at all explain the peculiar effect of inducing thoſe ſymptoms which properly and eſſentially conſtitute dyſentery. Of theſe ſymptoms the proximate cauſe is ſtill obſcure.—

the common opinion has been, that the diſeaſe depends upon an acrid matter thrown upon or ſomehow generated in the inteſtines, exciting their periſtaltic motion, and thereby producing the freqnent ſtools which occur in this diſeaſe. But this ſuppoſition cannot be adopted; for, in all the inſtances known, of acrid ſubſtances applied to the inteſtines, and producing frequent ſtools, they at the ſame time produce copious ſtools, as might be expected from acrid ſubſtances applied to any length of the inteſtines. This, however, is not the caſe in a dyſentery, in which the ſtools, however frequent, are generally in very ſmall quantity, and ſuch as may be ſuppoſed to proceed from the lower parts of the rectum only. With reſpect to the ſuperior portions of the inteſtines, and particularly thoſe of the colon, it is probable they are under a preternatural and conſiderable degree of conſtriction; for, as we have ſaid above, the natural fæces are ſeldom voided; and when they are, it is in a form which gives reaſon to ſuppoſe they have been long retained in the cells of the colon, and conſequently that the colon had been affected with a preternatural conſtriction. This is confirmed by almoſt all the diſſections which have been made of the bodies of dyſenteric patients; in which, when gangrene had not entirely deſtroyed the texture and form of the parts, large portions of the great guts have been found affected with a very conſiderable conſtriction.

The proximate cauſe of dyſentery, or at leaſt the chief part of the proximate cauſe, ſeems to conſiſt in a preternatural conſtriction of the colon, occaſioning at the ſame time, thoſe ſpaſmodic efforts which are felt in ſevere gripings, and which efforts propagated downwards to the rectum, occaſion there the frequent mucous ſtools and teneſmus. But whether this explanation ſhall be admitted or not, it will ſtill remain certain, that hardened fæces, retained in the colon, are the cauſe of the griping, frequent ſtools, and teneſmus; for the evacuation of theſe fæces, whether by nature or by art, gives relief from the ſymptoms mentioned; and it will be more fully and uſefully confirmed by this, that the moſt immediate and ſucceſsful cure of dyſentery is obtained by an early and conſtant attention to the preventing the conſtriction, and the frequent ſtagnation of fæces in the colon.

Cure. In the early periods of this diſeaſe, the objects chiefly to be aimed at are the following: The diſcharge of acrid matter depoſited in the alimentary canal; the counteracting the influence of this matter, when it cannot be evacuated; the obviating the effects reſulting from ſuch acrid matter as can neither be evacuated nor deſtroyed; and, finally, the prevention of any further ſeparation and depoſition of ſuch matter in the alimentary canal. In the more advanced periods of the diſeaſe, the principal objects are, the giving a proper defence to the inteſtines againſt irritating cauſes; the diminution of morbid ſenſibility of the inteſtinal canal; and the reſtoration of due vigour to the ſyſtem in general, but to the inteſtines in particular.

The moſt eminent of our late practitioners, and of greateſt experience in this diſeaſe, ſeem to be of opinion, that it is to be cured moſt effectually by purging, aſſiduouſly employed. The means may be various; but the moſt gentle laxatives are uſually ſufficient; and, as the medicine muſt be frequently repeated, theſe are the moſt ſafe, more eſpecially as an inflammatory ſtate ſo frequently accompanies the diſeaſe. Whatever laxatives produce an evacuation of natural fæces, and a conſequent remiſſion of the ſymptoms, will be ſufficient to effectuate the cure. But if the gentle laxatives ſhall not produce the evacuation now mentioned, ſomewhat more powerful muſt be employed; and Dr Cullen has found nothing more proper or convenient than tartar emetic, given in ſmall doſes, and at ſuch intervals as may determine its operation to be chiefly by ſtool. To the antimonial tartar, however, employed as a purgative, the great ſickneſs which it is apt to occaſion, and the tendency which it has, notwithſtanding every precaution, to operate as an emetic, are certainly objections. Another antimonial, at one time conſidered as an almoſt infallible remedy for this diſeaſe, the vitrum antimonii ceratum, is no leſs exceptionable, from the uncertainty and violence of its operation; and perhaps the ſafeſt and beſt purgatives are the different neutral ſalts, particularly thoſe containing foſſile alkali, ſuch as the ſoda vitriolata tartariſata or phoſphorata. Rhubarb, ſo frequently employed, is, he thinks, in ſeveral reſpects, amongſt the moſt unfit purgatives; and indeed from its aſtringent quality, it is exceptionable at the commencement of the affection, unleſs it be conjoined with ſomething to render its operation more briſk, ſuch as mild muriated mercury, or calomel as it is commonly called.

Vomiting has been held a principal remedy in this diſeaſe; and may be uſefully employed in the beginning, with a view to both the ſtate of the ſtomach and of the fever; but it is not neceſſary to repeat it often; and, unleſs the emetics employed, operate alſo by ſtool, they are of little ſervice. Ipecacuanha is by no means a ſpecific; and it proves only uſeful when ſo managed as to operate chiefly by ſtool.

For relieving the conſtriction of the colon, and evacuating the retained fæces, glyſters may ſometimes be uſeful; but they are ſeldom ſo effectual as laxatives given by the mouth; and acrid glyſters, if they be not effectual in evacuating the colon, may prove hurtful by ſtimulating the rectum too much.

The frequent and ſevere griping attending this diſeaſe, leads almoſt neceſſarily to the uſe of opiates; and they are very effectual for the purpoſe of relieving from the gripes: but, by occaſioning an interuption of the action of the ſmall inteſtines, they favour the conſtriction of the colon, and thereby aggravate the diſeaſe; and if, at the ſame time, the uſe of them ſuperſede in any meaſure the employing purgatives, it is doing much miſchief; and the neglect of purging ſeems to be the only thing which renders the uſe of opiates very neceſſary.

When the gripes are both frequent and ſevere, they may ſometimes be relieved by the employment of the ſemicupium, or by fomentation of the abdomen continued for ſome time. In the ſame caſe, the pains may be relieved, and the conſtriction of the colon may be taken off, by bliſters applied to the lower belly.

At the beginning of this diſeaſe, when the fever is any way conſiderable, blood-letting, in patients of tolerable vigour, may be proper and neceſſary; and, when the pulſe is full and hard, with other ſymptoms of an inflammatory diſpoſition, blood-letting ought to be repeated. But, as the fever attending dyſentery is often of the typhoid kind, or does, in the courſe of the diſeaſe, become ſoon of that nature, blood-letting muſt be cautiouſly employed.

From our account of the nature of this diſeaſe, it will be ſufficiently obvious, that the uſe of aſtringents in the beginning of it muſt be very pernicious. But although aſtringents may be hurtful at early periods of this affection, yet it cannot be denied that where frequent looſe ſtools remain after the febrile ſymptoms have ſubſided, they are often of great ſervice for diminiſhing morbid ſenſibility, and reſtoring due vigour to the inteſtinal canal. Accordingly, on this ground a variety of articles have been highly celebrated in this affection; among others we may mention the quaſſia, radix indica lopeziana, verbaſcum, extractum catechu, and gum kino, all of which have certainly in particular caſes been employed with great advantage. And perhaps alſo, on the ſame principles, we are to account for the benefit which has been ſometimes derived from the nux vomica, a remedy highly extolled in caſes of dyſentery by ſome of the Swediſh phyſicians; but this article, it muſt be allowed, often proves very powerful as an evacuant. Its effects, however, whatever its mode of operation may be, are too precarious to allow its ever being introduced into common practice; and in Britain, it has, we believe, been but very rarely employed. Whether an acrid matter be the original cauſe of the dyſentery, may be uncertain; but, from the indigeſtion, and the ſtagnation of fluids, which attend the diſeaſe, we may ſuppoſe that ſome acrid matters are conſtantly preſent in the ſtomach and inteſtines; and therefore that demulcents may be always uſefully employed. At the ſame time, from the conſideration that mild oily matters thrown into the inteſtines in conſiderable quantity always prove laxative, Dr Cullen is of opinion, that the oleaginous demulcents are the moſt uſeful. Where, however, theſe are not acceptable to the patient's taſte, thoſe of the mucilaginous and farinaceous kind, as the decoctum hordei, potio cretacea, &c. are often employed with advantage.

As this diſeaſe is ſo often of an inflammatory or of a putrid nature, it is evident that the diet employed in it ſhould be vegetable and aceſcent. Milk, in its entire ſtate, is of doubtful quality in many caſes; but even ſome portion of the cream is often allowable, and whey is always proper.—In the firſt ſtages of the diſeaſe, the ſweet and ſubacid fruits are allowable, and even proper. It is in the more advanced ſtages only that any morbid acidity ſeems to prevail in the ſtomach, and to require ſome reſerve in the uſe of aceſcents. At the beginning of the diſeaſe, abſorbents ſeem to be ſuperfluous; and by their aſtringent and ſeptic powers, they may be hurtful; but in after periods they are often of advantage.

When this diſeaſe is complicated with an intermittent, and is protracted from that circumſtance chiefly, it is to be treated as an intermittent, by adminiſtering the Peruvian bark, which in the earlier periods of the diſeaſe is hardly to be admitted.

CLASS II. NEUROSES.

ORDER I. COMATA.

COMATA, *Sauv.* Claſs VI. Ord. II. *Sag.* Claſs IX. Ord. V.
Soporoſi, *Lin.* Claſs VI. Ord. II.]
Adynamiæ, *Vog.* Claſs VI.
Nervorum reſolutiones, *Hoffm.* III. 194.
Affectus ſoporoſi, *Hoffm.* III. 209.
Motuum vitalium defectus, *Junck.* 114.

Genus XLII. APOPLEXIA. 255

The APOPLEXY.

Apoplexia, *Sauv.* gen. 182. *Lin.* 101. *Vog.* 229. *Boerh.* 1007. *Junck* 117. *Sag.* gen. 288. *Wepfer*, Hiſt. apoplecticorum.
Carus *Sauv.* gen. 181. *Lin.* 100. *Vog.* 231. *Boerh.* 1045. *Sag.* gen. 287.
Cataphora, *Sauv.* gen. 180. *Lin.* 99. *Vog.* 232. *Boerh.* 1048. *Sag.* gen. 286.
Coma, *Vog.* 232. *Boerh.* 1048.
Hæmorrhagia cerebri, *Hoffm.* II. 240.

To this genus alſo Dr Cullen reckons the following diſeaſes to belong.

Catalepſis, *Sauv.* gen. 176. *Lin.* 129. *Vog.* 230. *Sag.* gen. 281. *Boerh.* 1036. *Junck.* 44.
Affectus cerebri ſpaſmodico-ecſtaticus, *Hoffm.* III. 44.
Ecſtaſis, *Sauv.* gen. 177. *Vog.* 333. *Sag.* gen. 283.

The following he reckons ſymptomatic.

Typhomania, *Sauv.* gen. 178. *Lin.* 97. *Vog.* 23. *Sag.* gen. 284.
Lethargus, *Sauv.* gen. 197. *Lin.* 98. *Vog.* 22. *Sag.* gen. 285.

This diſeaſe appears under modifications ſo various, as to require ſome obſervations with reſpect to each.

Sp. I. The *Sanguineous* APOPLEXY 256

Deſcription. In this diſeaſe the patients fall ſuddenly down, and are deprived of all ſenſe and voluntary motion, but without convulſions. A giddineſs of the head, noiſe in the ears, corruſcations before the eyes, and redneſs of the face, uſually precede. The diſtinguiſhing ſymptom of the diſeaſe is a deep ſleep, attended with violent ſnorting; if any thing be put into the mouth, it is returned through the noſe; nor can any thing be ſwallowed without ſhutting the noſtrils; and even when this is done, the perſon is in the utmoſt danger of ſuffocation. Sometimes apoplectic patients will open their eyes after having taken a large doſe of an emetic; but if they ſhow no ſign of ſenſe, there is not the leaſt hope of their recovery. Sometimes the apoplexy terminates in an hemiplegia; in which caſe it comes on with a diſtortion of the mouth towards the ſound ſide, a drawing of the tongue the ſame way, and ſtammering of the ſpeech. Diſſections ſometimes ſhow a rupture of ſome veſſels of the meninges, or even veſſels of the brain itſelf; though ſometimes, if we may believe Dr Willis, no defect is to be obſerved either in the cerebrum or cerebellum.

Cauſes, &c. The general cauſe of a ſanguineous apoplexy is a plethoric habit of body, with a determination to the head. The diſeaſe therefore may be brought on by whatever violently urges on the circulation of the blood; ſuch as ſurfeits, intoxication, violent paſſions of the mind, immoderate exerciſe, &c. It takes place, however, for the moſt part, when the venous plethora has ſubſiſted for a conſiderable time in the ſyſtem. For that reaſon it commonly does not attack people till paſt the age of 60; and that whether the patients are corpulent and have a ſhort neck, or whether they are of a lean habit of body. Till people be paſt the age of childhood, apoplexy never happens.

Prognoſis. This diſeaſe very often kills at its firſt attack; and few ſurvive a repetition of the fit; ſo that thoſe who make mention of people who have ſurvived ſeveral attacks of the apoplexy, have probab- miſtaken the epilepſy for this diſeaſe. In no diſeaſe is the prognoſis more fatal; ſince thoſe who ſeem to be recovering from a fit, are frequently and ſuddenly carried off by its return, without either warning of its approach or poſſibility of preventing it. The good ſigns are when the diſeaſe apparently wears off, and the patient evidently begins to recover; the bad ones are when all the ſymptoms continue and increaſe.

Cure. The great object to be aimed at, is to reſtore the connection between the ſentient and corporeal parts of the ſyſtem; and when interruption to this connection proceeds from compreſſion in the brain by blood, this is to be attempted, in the firſt place, by large and repeated bleedings; after which, the ſame remedies are to be uſed as in the ſerous apoplexy, aftermentioned. The body is to be kept in a ſomewhat erect poſture, and the head ſupported in that ſituation.

257 Sp. II. The *Serous Apoplexy*.

Apoplexia pituitoſa, *Sauv*. ſp. 7. Apoplexia ſeroſa, *Preyſinger*, ſp. 4. *Morg*. de cauſis, &c. IV. LX.
Carus a hydrocephalo, *Sauv*. ſp. 16.
Cataphora hydrocephalica, *Sauv*. ſp. 6.
Cataphora ſomnolenta, *Sauv*. ſp. 1.
Lethargus literatorum, *Sauv*. 7. *Van Swieten* in Aphor. 1010. 2 γ and 3 α.

Deſcription. In this ſpecies the pulſe is weak, the face pale, and there is a diminution of the natural heat. On diſſection, the ventricles of the brain are found to contain a larger quantity of fluid than they ought; the other ſymptoms are the ſame as in the former.

Cauſes, &c. This may ariſe from any thing which induces a debilitated ſtate of the body, ſuch as depreſſing paſſions of the mind, much ſtudy, watching, &c. It may alſo be brought on by a too plentiful uſe of diluting, acidulated drinks. It doth not, however, follow, that the extravaſated ſerum above mentioned in the ventricles of the brain is always the cauſe of the diſeaſe, ſince the animal-humours are very frequently obſerved to ooze out in plenty through the coats of the containing veſſels after death, through no extravaſation took place during life.

Prognoſis. This ſpecies is equally fatal with the other; and what hath been ſaid of the prognoſis of the ſanguineous, may alſo be ſaid of that of the ſerous, apoplexy.

Cure. In this ſpecies veneſection can ſcarcely be admitted: acrid purgatives, emetics, and ſtimulating clyſters, are recommended to carry off the ſupperabundant ſerum; but in bodies already debilitated, they may perhaps be liable to the ſame exceptions with veneſection itſelf. Volatile ſalts, cephalic elixirs, and cordials, are alſo perſcribed; and in caſe of a hemiplegia ſupervening, the cure is to be attempted by aperient ptiſans, cathartics, and ſudorifics; gentle exerciſe, as riding in a carriage; with bliſters and ſuch ſtimulating medicines as are in general had recourſe to in affections originally of the paralytic kind.

Sp. III. *Hydrocephalic Apoplexy*, or *Dropſy* of the *Brain*. 258

Hydrocephalus interior, *Sauv*. ſp. 1.
Hydrocephalus internus, *Whytt's* works, pag. 725. London Med. Obſ. vol. iv. art. 3, 6, and 25. *Gaudelius* de hydrocephalo, apud *Sandifort* Theſaur. vol. ii.
Hydrocephalus acutus, *Quin*, *Diſſ*. de hydrocephalo, 1779.
Aſthenia a hydrocephalo, *Sauv*. ſp. 3.

Hiſtory and deſcription. This diſeaſe has been accurately treated within theſe few years by ſeveral eminent phyſicians, particularly the late Dr Whytt, Dr Fothergill, and Dr Watſon; who concur in opinion with reſpect to the ſeat of the complaint, the moſt of its ſymptoms, and its general fatality. Out of twenty patients that had fallen under Dr Whytt's obſervation, he candidly owns that he had been ſo unfortunate as to cure only one who laboured under the characteriſtic ſymptoms of the hydrocephalus; and he ſuſpects that thoſe who imagine they have been more ſucceſsful, had miſtaken another diſtemper for this. It is by all ſuppoſed to conſiſt in a dropſy of the ventricles of the brain; and this opinion is fully eſtabliſhed by diſſections, it is obſerved to happen more commonly to healthy, active, lively children, than to thoſe of a different diſpoſition.

Dr Whytt ſuppoſes that the commencement of this diſeaſe is obſcure; that it is generally ſome months in forming; and that, after ſome obvious urgent ſymptoms rendering aſſiſtance neceſſary, it continues ſome weeks before its fatal termination. This, in general, differs from what has hitherto been obſerved by Dr Fothergill, the latter informing us, that he has ſeen children, who, from all appearence, were healthy and active, ſeized with this diſtemper, and carried off in about 14 days. He has ſeldom been able to trace the commencement of it above three weeks.

Though the hydrocephalus be moſt incident to children, it has been ſometimes obſerved in adults; as appears from a caſe related by Dr Huck, and from ſome others.

When the diſeaſe appears under its moſt common form, the ſymptoms at different periods are ſo various as to lead Dr Whytt to divide the diſeaſe into three ſtages, which are chiefly marked by changes occuring in the condition of the pulſe. At the beginning it is quicker than natural; afterwards it becomes uncommonly ſlow; and towards the concluſion of the diſeaſe it becomes again quicker than natural, but at the ſame time very irregular.

Thoſe who are ſeized with this diſtemper uſually complain firſt of a pain in ſome part below the head; moſt commonly about the nape of the neck and ſhoulders; often in the legs; and ſometimes, but more rarely, in the arms. The pain is not uniformly acute, nor always fixed to one place; and ſometimes does not affect the limbs. In the latter caſe, the head and ſtomach have been found to be moſt diſordered; ſo that when the pain occupied the limbs, the ſickneſs or head-ach was leſs conſiderable; and when the head became the ſeat of the complaint, the pain in the limbs was ſeldom or never mentioned. Some had very violent ſickneſſes and violent head-achs alternately. From being perfectly well and ſportive; ſome were in a few hours ſeized with thoſe pains in the limbs, or with ſickneſs, or head-ach, in a ſlight degree, commonly after dinner; but ſome were obſerved to droop a few days before they complained of any local indiſpoſition. In this manner they continued three, four, or five days more or leſs, as the children were healthy and vigorous. They then commonly complain of an acute deep-ſeated pain in the head, extending acroſs the forehead from temple to temple; of which, and a ſickneſs they alternately complain in ſhort and affecting exclamations; doſing a little in the intervals, breathing irregularly, and ſighing much while awake. Sometimes their ſighs, for the ſpace of a few minutes, are inceſſant.

As the diſeaſe advances, the pulſe becomes ſlower and irregular, the ſtrokes being made both with unequal force and in unequal times, till within a day or two of the fatal termination of the diſorder, when it becomes exceeding quick; the breathing being at the ſame time deep, irregular, and laborious. After the firſt acceſs, which is often attended with feveriſh heats eſpecially towards evening, the heat of the body is for the moſt part temperate, till at laſt it keeps pace with the increaſing quickneſs of the pulſe. The head and præcordia are always hot from the firſt attack. The ſleeps are ſhort and diſturbed, ſometimes interupted by watchfulneſs; beſides which there are ſtartings.

In the firſt ſtage of the diſeaſe there ſeems to be a peculiar ſenſibility of the eyes, as appears from the intolerance of light. But in the progreſs of the diſeaſe a very oppoſite ſtate occurs: The pupil is remarkably dilated, and cannot be made to contract by the action even of ſtrong light; ſuch, for example as by bringing a candle very near to it. In many caſes there is reaſon to believe that total blindneſs occurs: Often alſo the pupil of one eye is more dilated than that of another, and the power of moving the eyes is alſo morbidly affected. Thoſe children, who were never obſerved to ſquint before, often become affected with a very great degree of ſtrabiſmus. The patients are unwilling to be diſturbed for any purpoſe, and can bear no poſture but that of lying horizontally. One or both hands are moſt commonly about their heads. The urine and ſtools come away inſenſibly. At length the eyelids become paralytic, great heat accompanied with ſweat overſpreads the whole body, reſpiration is rendered totally ſuſpirious, the pulſe increaſes in its trembling indulations beyond the poſſibility of counting, till the vital motions entirely ceaſe; and ſometimes convulſions conclude the ſcene.

Many of the ſymptoms above enumerated are ſo common to worm-caſes, teething, and other irritating cauſes, that it is difficult to fix upon any which particularly characteriſe this diſeaſe. The moſt peculiar ſeem to be the pains in the limbs, with ſickneſs and inceſſant head-ach; which, though frequent in other diſeaſes of children, are neither ſo uniformly nor ſo conſtantly attendant as in this. Another circumſtance obſerved to be familiar, if not peculiar to this diſtemper, is, that the patients are not only coſtive, but it is likewiſe with the greateſt difficulty that ſtools can be procured. Theſe are generally of a very dark greeniſh colour with an oilineſs or a glaſſy bile, rather than the ſlime which accompanies worms; and they are, for the moſt part extremely offenſive. No poſitive concluſion can be drawn from the appearance of the urine; it being various, in different ſubjects, both in its colour and contents, according to the quantity of liquor they drink, and the time between the diſcharges of the urine. From their unwilinguefs to be moved, they often retain their water 12 or 15 hours, and ſometimes longer. In complaints ariſing from worms, and in dentition, convulſions are more frequent than in this diſorder. Children ſubject to fits are ſometimes ſeized with them a few days before they die. Sometimes theſe contine 24 hours inceſſantly, and till they expire.

Cauſes. The cauſes of internal hydrocephalus are very much unknown. Some ſuppoſe it to proceed from a rupture of ſome of the lymphatic veſſels of the brain. But this ſuppoſition is ſo far from being confirmed by any anatomical obſervation, that even the exiſtence of ſuch veſſels in the brain is not clearly demonſtrated. That lymphatics, however, do exiſt in the brain, cannot be doubted; and one of the moſt probable cauſes giving riſe to an accumulation of water in the brain is a diminiſhed action of theſe. Here, however, as well as in other places, accumulation may alſo be the conſequence of augmented effuſion; and in this way, an inflammatory diſpoſition, as ſome have ſuppoſed, may give riſe to the affection, But from whatever cauſe an accumulation of water in the ventricles of the brain may be produced, there can be no doubt that from this the principal ſymptoms of the diſeaſe ariſe, and that a cure is to be accompliſhed only by the removal of it. It is, however, probable, that the ſymptoms are ſomewhat varied by the poſition of the water, and that the affection of viſion in particular is often the conſequence of ſome morbid ſtate about the *thalami nervorum opticorum*; at leaſt, in many caſes, large collections of water in the ventricles have occurred, without either ſtrabiſmus, intolerance of light, or dilatation of the pupil. And in caſes where theſe ſymptoms have taken place to a remarkable degree, while upon diſſection after death but a very ſmall collection of water was found in the ventricles, it has been obſerved that a peculiar tumid appearance was diſcovered about the optic nerves, which upon examination was found to ariſe from water in the cellular texture. This may have given compreſſion producing a ſtate of inſenſibility; but it may have been preceded, or it may even have originated from, ſome inflammatory affection of theſe parts producing the intolerance of light.

Progreſs and Cure. Till very lately this diſorder was reckoned totally incurable; but of late it has been alleged, that mercury if applied in time, will remove every ſymptom. This remedy was firſt thought of by Dr Dobſon of Liverpool, and afterwards employed apparently with ſucceſs by Dr Percival and others. The method of exhibiting this medicine in order to effect a cure, as well as the inutility of other medicines, will fully appear from the following caſes.

CASE I. By DR PERCIVAL.

"September 4. 1777. Maſter H. a child at the breaſt, aged ſeven months, has laboured about a fortnight under a ſlow irregular fever. His eyes have been now and then a little diſtorted; he has been affected wirh ſome degree of ſtupor; his gums have been inflamed and tender; and his mouth uncommonly dry. No tooth has yet made its appearance. An emetic has been adminiſtered; a bliſter applied to his back; and his belly has been kept ſoluble by repeated ſmall doſes of magneſia. During the action of the bliſter, he was thought to be much better, but he ſoon relapſed into his former ſtate.

"About three o'clock this morning he was convulſed: at nine I ſaw him; and from his countenance inſtantly ſuſpected a dropſy of the brain. The ſymptoms coufirmed my aprehenſions. His ſkin was hot; yet his pulſe beat only 78 ſtrokes in a minute, which were irregular. The pupils ef his eyes were conſiderably, but unequally, dilated; nor did they contract much when a lighted candle was ſuddenly held before them. He often ſquinted, eſpecially with the right eye, and ſeemed to take no notice of any objects around him. He refuſed the breaſt, and ſeldom ſwallowed till the lips and tongue had been ſtimulated with a feather. During ſeveral days paſt, he had been frequently obſerved to rub the end of his noſe when his hand was at liberty; and notwithſtanding his ſtupor, he had been uncommonly watchful. I examined his head and found a manifeſt tumor of the bregma, which had never before been noticed. Convinced by all theſe circumſtances that the child laboured under the hydrocephalus internus, and that he was now in the ſecond ſtage of that diſorder, I directed ten grains of the *unguentum mercuriale mitius* to be rubbed into his thighs every three hours, till the mouth ſhould be affected, and a tea-ſpoonful of the following mixture to be given whenever the convulſive ſymptoms recurred.

R. *Salis ammon. vol.* ℈i. *Succi Lemon.* ʒvi. *Moſch. opt. mucilagine gum. Arabic. ſolut.* gr. vi. *Sacch. alb.* q. ſ. *adgratium. M.*

"Small bliſters were applied on each ſide of the head, juſt below the bregma; and a folded rag, frequently moiſtened with brandy, was laid upon the tumor to promote abſorption. An emetic had been given early in the morning, by which a large quantity of bile was diſcharged; and a veſicatory had alſo been applied to his leg.

"September 5. nine o'clock. The child has had frequent convulſions in the night; his right eye is much diſtorted; and it has been remarked, that he ſeldom moves the right hand. The pulſe beat 120 ſtrokes in a minute. Two ſcruples of the mercurial ointment have been uſed, and he has taken five grains of muſk. A large diſcharge of ſerum has been produced by the bliſters. Five o'clock, P. M. the tumor of the head is ſenſibly diminiſhed; the child's mouth is now moiſt, and often filled with ſaliva; and his tongue appears to be ſwolen. His pulſe beat 146 ſtrokes in a minute, I directed another bliſter to be applied to the head.

"September 6. His convulſions have been much ſlighter; his eyes are frequently diſtorted; and the pupils of each are more contracted. The ſtupor is conſiderably abated; the child ſeems to take ſome notice, diſtinguiſhes taſte, and ſwallows freely. The muſk has been continued; and half a dram more of the mercurial ointment has been conſumed. A clyſter was injected laſt night. but ineffectually: I therefore preſcribed a grain of jalap, mixed with an equal quantity of ſugar, to be given every three hours, till a motion to ſtool ſucceeded.

"September 7. The child has paſſed the night more comfortably, but not free from convulſions. His head has ſweated profuſely, and the bliſters have run much. The tumor of the bregma is conſiderably reduced. The jalap operated gently laſt night, and the mercurial unction has been twice repeated. There is an evident mitigation of all the ſymptoms.

"September 8. About eleven o'clock laſt night the child was attacked with ſevere convulſions, which recurred frequently till ſix o'clock this morning. He has had a ſhort ſleep, and is now compoſed. His pulſe beats 140 ſtrokes in a minute, his heat is moderate; and his ſkin ſoft and perſpirable. The mercurial ointment has been again uſed; but, though his gums and tongue are ſore and very moiſt, his breath is not offenſive. I directed a grain of calomel to be immediately given, to procure a ſtool; and a bliſter to be applied to the occiput,

"September 10, He has paſſed two nights almoſt entirely free from convulſions. Ten grains of the mercurial ointment have been again rubbed into his thighs. The doſe of calomel occaſioned three very offenſive ſtools; and directions are given to repeat it, as he is again coſtive. The bliſter aplied to the occiput, like, the others, has produced a very copious diſcharge. The tumor of the head is now ſcarcely perceptible. Pulſe 120.

"September 12 At 12. o'clock laſt night, the convulſions recurred with greater violence than ever, and ſtill continne. Two teeth have almoſt protruded through the upper, and the ſame number through the lower gum. Pulſe 160, tremulous, and irregulur. I directed that the child ſhould be immediately put into a warm bath, and that the following remedies ſhould be adminiſtered.

℞ *Infuſ. rad. valer. fortiſſimi* ℥ii.
Aſaf.ætid. electæ ℈ß. *M.* ſ. *Enema ſtatim injiciendum.*
℞ *Tinct. valer. volat.* ʒii. *Dentur guttæ* jii, *Subinde e cochleari parvulo infuſi rad. valer. ſylv. ſub forma theæ parati.*

"The convulſions continued but with leſs violence; and the child expired about one o'clock in the afternoon."

On this caſe the Doctor makes the following obſervations.

"The deplorable caſe which I have related ap-

Comata

pears to have originated from the irregular action produced in the ſyſtem by dentition, and from the want of a due ſecretion of ſaliva in the mouth, by which the fluid diſcharges were probably increaſed in the ventricles of the brain. That theſe diſcharges were diminiſhed, and that the extravaſated water was abſorbed, by the powerful action of the mercury, may be preſumed from the mitigation of all the ſymptoms which ſucceeded the ſalivation. And I am inclined to believe, that the convulſions under which the child expired were more owing to the irritation of his gums by the protruſion of four teeth, than to any remaining water in the brain; for the tumor of the head had entirely diſappeared, and after death there was a manifeſt depreſſion of the bregma. During the ſpace of a week, 110 grains of the unguentum mercuriale mitius, which contains about 22 grains of mercury, was conſumed in the uſual way of friction. Perhaps half of this quantity might be abſorbed, and carried into the courſe of circulation; to which may be be added, part of the two grains of the calomel adminiſtered internally. The ſymptoms of the ſalivation were not violent; and the effects of the mercury did not appear formidable or alarming, even to the parents of the child, who were appriſed of the nature of the diſorder, and fully approved of the trial of this new method of treating it."

Case II. By Dr Dobson

"On the 13th of February 1775, I was called to the only ſon of Mr C. a gentleman of this place: the child was between three and four years of age; had been indiſpoſed about eight days; and had frequently complained of pain in his head and wearineſs, and pains in his limbs: had been ſick by fits, and ſometimes vomited; was feveriſh, and could not bear the light.

"I was much alarmed on hearing this account, as the *hydrocephalus internus* had already proved fatal to three children of this family, who had all been under my care. And that this had been the diſeaſe was evident, both from the ſymptoms and the appearances on diſſection. But my alarm was much farther increaſed on examining the little patient. The pulſe I found very frequent and irregular. The head hot, the cheeks fluſhed; the pupils dilated, and a great degree of ſtrabiſmus. There remained no doubt with reſpect to the nature of the diſeaſe.

"An emetic, ſome calomel powders, and a purgative, had been adminiſtered, without affording any relief. I directed the pediluvium, and emetic tartar, to be given in ſuch doſes as to excite nauſea.

"February 14th. The ſymytoms the ſame, with frequent ſtartings, diſturbed ſleep, and toſſing from ſide to ſide on the pillow. A bliſter was applied between the ſhoulders, the pediluvium repeated, and the emetic tartar continued.

"15th. Comatoſe, reſtleſs, and ſhrieking by fits. The pulſe ſlower than in health, and the eyes inſenſible even to the impreſſions of ſtrong light.

"As I had no hope of doing any thing effectual for the recovery of my patient, I paid my viſits, preſcribed, and gave directions with a foreboding and heavy heart. Anxiouſly, however, conſidering the caſe in different points of view, and fully convinced that it was vain to purſue the uſual line of practice, it occurred to me, that mercurials, ſo far urged as to enter the courſe of circulation, and affect the ſalivary glands, might poſſibly reach the ſyſtem of abſorbents in the ventricles of the brain, and thus remove the extravaſated fluid.

Apoplexia.

"The ſhort continuance of the diſeaſe, and the apparent ſtrength of my patient, were favourable to the trial of this method. No time, however, was to be loſt. The parents were conſulted, and readily gave their ſanction to the propoſal; for they were convinced, that, unleſs ſome powerful ſteps were taken, this their only ſon muſt be numbered with thoſe of their children who had already fallen a ſacrifice to the diſeaſe.

"The mercurial courſe, therefore, was commenced, and urged on with caution and expedition. In 48 hours the breath began to be offenſive; the gums were reddiſh and ſwelled; and the ſymptoms of the diſeaſe, ſo far as could be diſtinguiſhed, were ſomewhat abated. In 48 hours more the ptyaliſm came on, and the diſeaſe was evidently declining. Between the 15th and 22d he took 20 grains of calomel, and one drachm of the ſtrongeſt mercurial ointment was likewiſe rubbed in well upon the legs and thighs. The doſe of calomel was one grain, mixed with a little ſugar, and repeated at ſuch intervals as the circumſtances of the caſe pointed out.

"After the 22d no more mercurials were adminiſtered: a moderate ptyaliſm continued for five or ſix days, then gradually ceaſed, and the diſeaſe was entirely removed. The bark was then given, as the beſt tonic remedy after the mercurial courſe, and as the beſt preſervative againſt a relapſe. The ſtrabiſmus, I obſerved, was the laſt ſymptom which diſappeared.

"From the 15th, no other medicines were uſed except mercurials. The three ſiſters of the above patient, who all died of this diſeaſe, were treated with bliſters; and to one of them they were applied in ſucceſſion to the head, behind the ears, and between the ſhoulders."

Case III. By Dr Percival.

"One of my own children, a girl, aged three years and three months, has lately been a ſevere ſufferer under this alarming malady. As ſoon as the characteriſtic ſymptoms of the diſeaſe clearly manifeſted themſelves, I laid aſide all other remedies, convinced, by repeated obſervation, of their inſufficiency; and truſted ſolely, though with much ſolicitude, to the internal and external uſe of mercury. In 48 hours, ſigns of amendment appeared, and her recovery was perfected in ſix days. During this ſpace of time, thirteen grains of calomel were adminiſtered, and ſeven ſcruples of *unguentum mercuriale fortius* carefully rubbed into her legs."

Case IV. By Mr John Mackie Surgeon in Huntington.

John Algood, aged 27, of a thin habit of body, accuſtomed for four or five years paſt to work in a tan-yard in a very ſtooping poſture, was attacked in the beginning of May with an irregular intermitting fever, accompanied with much pain in his joints.

Theſe complaints continued till about the middle of June, when he was ſeized with a violent and conſtant pain in the back-part of his head, attended with great giddineſs, noiſe in his head and ears, dimneſs of ſight, &c. and his fever became more continued. He lay in this ſtate upwards of a month, without receiving any benefit from ſome medicines which he took during this period.

Mr Mackie was called to him in the middle of July, and found him labouring under the following ſymptoms: A fixed pain on the right ſide and back part of his head, which was frequently ſo acute as to make him quite outrageous, crying out, tearing his hair, beating himſelf on the head, &c. He had ſuch a giddineſs, that, unleſs ſtrongly held, he could not ſupport himſelf a moment in an upright poſture. He could not bear the light; and, when he did venture to open his eyes, could not ſee objects diſtinctly. His pupils were uncommonly dilated; and his right eye ſeemed drawn outward, and rather contracted in its volume. He complained of a ſtrange palpitating noiſe in his head and ears; and ſaid, he felt at times as if there was a weight of water falling from one ſide of his head to the other. He was, in general, ſenſible; but, on aſking him two or three queſtions together, he became confuſed, and, like a perſon with an oppreſſed brain, anſwered with heſitation, quite wide of the queſtion, and often oppoſite to what he meant. Along with theſe, he had a hot ſkin, ſmall quick pulſe, thirſt, a foul tongue, urine in ſmall quantity and high-coloured; he was emaciated, ſick, coſtive, and ſweated much; had often a kind of ſtupor, but very little ſleep. Once in the 24 hours he had generally a remiſſion (of three or four hours continuance) of the febrile ſymptoms, but of none of the other complaints.

July 16th. Ordered three or four leeches to be applied to each temple immediately; an emetic to be taken in the evening, and a cooling purge to-morrow morning.

17th. In the evening found the leeches had taken away a good deal of blood, and the vomit and purge operated well. No change in the complaints, except that the ſickneſs is a little abated. He ſcreamed greatly on attempting to raiſe his head from the pillow.

Ordered his head to be ſhaved, and a ſharp bliſter to be applied all over the occiput, large enough to cover the nape of the neek; alſo one on the inſide of the leg. Internally.—R. *Nitri puri*, dr. ſs. *Camphoræ*, gr. iv. M. f. *pulvis; quarta quaque hora ſumendus durante febrile calore.* R. *Pulv. cort. Peruvian.* dr. i. *Pulv. rad. valerian. ſylv.* dr. ſs. M. f. *pulvis, exhibendus quamprimum remiſſio appareat, & repetendus ſi ultra horas tres pergat.* Thin milk-gruel and barley-water for drink.

July 19th. The bliſters have diſcharged much, and he has taken the medicines punctually; but the fever and other complaints remain as before. Pulſe very irregular; pain in the head and reſtleſſneſs extreme.

I left off the camphor; and in its ſtead added to each nitrous powder, tartar emetic, gr. $\frac{1}{4}$. Dreſſed the bliſters with the *unguent. ad veſicatoria.*

21ſt. Two doſes of the bark and valerian were given during the two laſt remiſſions of the fever, which were full four hours each; but to day there appears no kind of amendment. All the ſymptoms continue much the ſame. Shrieked out much, and talked incoherently. Has had no ſtool ſince he took his phyſic. Ordered a laxative glyſter to be thrown up directly, and the medicines to be continued as on the 19th.

23d. The glyſter procured two motions. Has ſweated profuſely through the laſt 48 hours. Bliſters have run freely. The two laſt diurnal remiſſions not quite ſo diſtinct. No abatement of the other complaints. The pain, giddineſs, ſtupor, contortion of the eyes, &c. remain in as great a degree as ever.

Mr Mackie now left off all other medicines, and ordered ten grains of calomel, made into a bolus with conſerve of roſes, to be taken at bed-time: at the ſame time, a drachm of the ſtrong mercurial ointment was directed to be rubbed into the ankles; and both to be repeated every night.

25th. Found no alteration. Fever and other ſymptoms the ſame. Bliſters heal, having been dreſſed theſe two days with baſilicon. The calomel, and mercurial friction, ordered to be continued as on the 23d.

26th. Mr Mackie found him complaining much of being griped. Had two purging ſtools in the laſt 24 hours. His gums were a little tender, and his breath beginning to be tainted. In other reſpects as uſual. Left off the calomel, and ordered a double quantity of the mercurial ointment to be rubbed into his thighs every night.

28th. He had a calmer night than any for theſe two months paſt. For the firſt time, he ſaid the pain of his head was abated; he looked more compoſed; his ſkin felt cooler; his pulſe more full, and not ſo quick. He complained of his mouth being ſore, and his tongue ſwelled; and had diſcharged a good deal of ſaliva in the night. Only one dram of the ointment to be rubbed in, for the two next nights.

30th. He ſpit about three quarts during the laſt 48 hours, and complains of much heat in his mouth; but all his other complaints better. Pain in his head almoſt gone, excepting now and then a ſhoot. Giddineſs much abated. He ſaid he often felt a trickling kind of motion, as of water running along the inſide of his temples; but this ſenſation was without pain. He could ſit up in bed, and feed himſelf; was ſenſible, and in ſpirits. Pulſe regular, and not above 70 in a minute. He has had a remiſſion of upwards of ſix hours to-day; ordered the ointment to be left off.

Aug. 1ſt. Continues to ſpit freely. Had yeſterday a ſmart return of the fever; which, however, only held him about 12 hours. To-day there is a perfect remiſſion, and he is in every reſpect much mended.—Has had ſome hours good ſleep. Complains very little of pain. Got out of bed for the firſt time; ſat up three hours; and could even bear the light without being diſturbed by it. Complained of being hungry. Allowed plenty of milk-porridge and ſmall broth.

3d. The ſpitting keeps up to about a quart in the 24 hours. Found him out of bed to-day, and almoſt without complaints. He ſaid his head was well; and that he only wanted ſtrength and to get rid of his fever and ſore mouth. The remiſſions were now almoſt as long as the paroxyſms, being about 12 hours each. Has taken no medicine internally ſince he left off the calomel, and was coſtive. Ordered a doſe of rhubarb; and after its operation a dram of the bark every four hours during the remiſſions.

6th The ſpitting begins to decline. He has had no fever for the laſt 24 hours. He ſleeps well; and has an appetite, if the ſoreneſs of his mouth would let him eat. Headach and giddineſs gone; but his pupils ſtill continue much dilated. Ordered him another rhubarb-purge, and the bark to be continued every ſix hours.

6th. Has had no fever, or other complaints. Spitting inconſiderable; mouth better; aſpect more natural; is able to walk about, and mends daily. Allowed him a more generous ond ſubſtantial diet, and continued the bark twice a-day for another week.

From this time, he continued to get ſtrength apace; had good nights, good appetite, a perfect freedom from head-ach and fever; and, on the 23d, went to work, being in every reſpect quite well, and has continued ſo ever ſince.

This patient did not ſeem to receive the ſmalleſt benefit from the bliſters, or any thing elſe, till he took the mercury, which acted like a ſpecific; and the fever ſeemed to be altogether ſymptomatic, as it eaſily yielded after the other complaints were removed.

Although it muſt be allowed, that the affection here deſcribed was in many reſpects an anomalous one, yet many of the circumſtances render it in ſome degree probable that it depended on water in the head; and there are ſtrong reaſons for inferring that the mercury puſhed ſo far as to excite ſalivation, was the means by which the cure was accompliſhed.

It is not wonderful that the publication of theſe caſes ſhould have led to the frequent employment of mercury in hydrocephalic affections. We are however, ſorry to add, that extenſive employment of this remedy in ſuch caſes has by no means confirmed the favourable opinion which ſome were diſpoſed to entertain of it. It has been found, that in many caſes where mercury with hydrocephalic patients had been employed both internally and externally to a very great extent, no ſalivation was produced. Some, therefore, have even gone ſo far as to conclude, that ſalivation cannot be induced in this diſeaſe; and there is little reaſon to doubt. that, in the advanced periods of the diſeaſe, there occurs both an inſenſibility and diminiſhed action of the abſorbents, by which alone mercury can be introduced into the ſyſtem; and likewiſe of the ſalivary organs, on which it muſt act before any obvious ſalivation can be induced. But, beſides that mercury is often given in this diſeaſe even to a great extent without producing any obvious effect, we muſt alſo mention with regret, that in not a few caſes of hydrocephalus, where mercury copiouſly exhibited at an early period produced ſalivation, the diſeaſe nevertheleſs has had a fatal termination, and it muſt be confeſſed, that an effectual remedy in this complaint ſtill remains to be diſcovered.

At the ſame time; beſides the caſes already mentioned, mercury has alſo ſucceeded in ſeveral others which had every appearance of hydrocephalus; and as we are yet unacquainted with any remedy, not even excepting bliſters, of which ſome are diſpoſed to think very favourably, on which more dependence is to be put, the careful and regular employment of it ſhould not be neglected in any inſtance of this affection, unleſs ſome circumſtance occur ſtrongly contraindicating its uſe.

Sp. IV. Apoplexy *from Atrabiliſ.* 259

Apoplexia atrabiliaris, *Sauv.* ſp. 12. *Preyſinger.* ſp. 6.

This takes place in the laſt ſtage of the diffuſion of bile through the ſyſtem, i. e. of the black jaundice, and in ſome caſes the brain hath been found quite tinged brown. It cannot be thought to admit of any cure.

Sp. V. Apoplexy from *External Violence.* 260

Apoplexia traumatica, *Sauv.* ſp. 2.
Carus-traumaticus, *Sauv.* ſp. 5.

The treatment of this diſeaſe, as it ariſes from ſome external injury, properly falls under the article Surgery.

Sp. VI. Apoplexy *from Poiſons.* 261

Apoplexia temulenta, *Sauv.* ſp. 3.
Carus a narcoticis, *Sauv.* ſp. 14.
Lethargus a narcoticis, *Sauv.* ſp. 3.
Carus a plumbagine, *Sauv.* ſp. 10.
Apoplexia mephitica, *Sauv.* ſp. 14.
Aſphyxia a mephitide, *Sauv.* ſp. 9.
Aſphyia a muſto, *Sauv.* ſp. 3.
Catalepſis a fumo, *Sauv.* ſp. 3.
Aſphyxia a fumis, *Sauv.* ſp. 2.
Aſphyxia a carbonne, *Sauv.* ſp. 16.
Aſphyxia foricariorum, *Sauv.* ſp. 11.
Aſphyxia ſideratorum, *Sauv.* ſp. 10.
Carus ab inſolatione, *Sauv.* ſp. 12.
Carus a frigore, *Sauv.* ſp. 15.
Lethargus a frigore, *Sauv.* ſp. 6.
Aſphyxia congelatorum, *Sauv.* ſp. 5.

The poiſons which bring on an apoplexy when taken internally may be either of the ſtimulant or ſedative kind, as ſpirituous liquors, opium, and the more virulent kinds of vegetable poiſons. The vapours of mercury or of lead, in great quantity, will ſometimes produce a ſimilar effect; though commonly they produce rather a paralyſis, and operate ſlowly. The vapours of charcoal, or fixed air, in any form, breathed in great quantity, alſo produce an apoplexy, or a ſtate very ſimilar to it; and even cold itſelf produces a fatal ſleep, though without the apoplectic ſnorting.—To enumerate all the different ſymptoms which affect the unhappy perſons who have ſwallowed opium, or any of the ſtronger vegetable poiſons, is impoſſible, as they are ſcarce to be found the ſame in any two patients. The ſtate induced by them ſeems to differ ſomewhat from that of a true apoplexy; as it is commonly attended with convulſions, but has the particular diſtinguiſhing ſign of apoplexy, namely, a very difficult breathing or ſnorting, more or leſs violent according to the quantity of poiſonous matter ſwallowed.

Of the poiſonous effects fixed of air, Dr Percival gives the following account. "All theſe noxious vapours, whether ariſing from burning charcoal, the fermenting grape, the Grotti di Cani, or the cavern of Pyrmont, operate nearly in the ſame manner. When accumulated and confined, their effects are often inſtantaneous:

ſtantaneous: they immediately deſtroy the action of the brain and nerves, and in a moment arreſt the vital motions. When more diffuſed, their effects are ſlower, but ſtill evidently mark out a direct affection of the nervous ſyſtem.

" Thoſe who are expoſed to the vapours of the fermenting grape, are as inſtantly deſtroyed as they would be by the ſtrongeſt electrical ſhock. A ſtate of inſenſibility is the immediate effect upon thoſe animals which are thruſt into the Grotti di Cani, or the cavern of Pyrmont: the animal is deprived of motion, lies as if dead; and if not quickly returned into the freſh air, is irrecoverable. And if we attend to the hiſtories of thoſe who have ſuffered from the vapours of burning charcoal, we ſhall in like manner find, that the brain and moving powers are the parts primarily affected.

" A cook who had been accuſtomed to make uſe of lighted charcoal more than his buſineſs required, and to ſtand with his head over theſe fires, complained for a year of very acute pain in the head; and after this, was ſeized with a paralytic affection of the lower limbs, and a ſlow fever.

" A perſon was left reading in bed with a pan of charcoal in a corner of the room. On being viſited early the next morning, he was found with his eyes ſhut, his book open and laid on one ſide, his candle extinguiſhed, and to appearance like one in a deep ſleep. Stimulants and cupping-glaſſes gave no relief; but he was ſoon recovered by the free acceſs of freſh air.

" Four priſoners, in order to make their eſcape, attempted to deſtroy the iron work of their windows, by the means of burning charcoal. As ſoon as they commenced their operations, the fumes of the charcoal being confined by the cloſeneſs of the priſon, one of them was ſtruck dead; another was found pale, ſpeechleſs, and without motion; afterwards he ſpoke incoherently, was ſeized with a fever, and died. The other two were with great difficulty recovered.

" Two boys went to warm themſelves in a ſtove heated with charcoal. In the morning they were found deſtitute of ſenſe and motion, with countenances as compoſed as in a placid ſleep. There were ſome remains of pulſe; but they died in a ſhort time.

" A fiſherman depoſited a large quantity of charcoal in a deep cellar. Some time afterwards, his ſon, a healthy ſtrong man, went down into the cellar with a pan of burning charcoal and a light in his hand. He had ſcarcely deſcended to the bottom, when his candle went out. He returned, lighted his candle, and again deſcended. Soon after, he called aloud for aſſiſtance. His mother, brother, and a ſervant, haſted to give him relief; but none of them returned. Two others of the village ſhared the ſame fate. It was then determined to throw large quantities of water into the cellar; and after two or three days, they had acceſs to the dead bodies.

" Cœlius Aurelianus ſays, that thoſe who are injured by the fumes of charcoal become cataleptic. And Hoffman enumerates a train of ſymptoms which in no reſpect correſpond with his idea of ſuffocation. Thoſe who ſuffer from the fumes of burning charcoal, ſays he, have ſevere pains in the head, great debility, faintneſs, ſtupor, and lethargy.

" It appears from the above hiſtories and obſervations, that theſe vapours exert their noxious effects on the brain and nerves. Sometimes they occaſion ſudden death; at other times, the various ſymptoms of a debilitated nervous ſyſtem, according as the poiſon is more or leſs concentrated. The olfactory nerves are firſt and principally affected, and the brain and nervous ſyſtem by ſympathy or conſent of parts. It is well known, that there is a ſtrong and ready conſent between the olfactory nerves and many other parts of the nervous ſyſtem. The effluvia of flowers and perfumes, in delicate or irritable habits, produce a train of ſymptoms, which, though tranſient, are analogous to thoſe which are produced by the vapours of charcoal; viz. vertigo, ſickneſs, faintneſs, and ſometimes a total inſenſibility. The female malefactor, whom Dr Mead inoculated by putting into the noſtrils doſſils of cotton impregnated with variolous matter, was, immediately on the introduction, afflicted with a moſt excruciating head-ach, and had a conſtant fever till after the eruption.

" The vapours of burning charcoal, and other poiſonous effluvia, frequently produce their prejudicial, and even fatal effects, without being either offenſive to the ſmell or oppreſſive to the lungs. It is a matter of importance, therefore, that the common opinion ſhould be more agreeable to truth; for where ſuffocation is ſuppoſed to be the effect, there will be little apprehenſion of danger, ſo long as the breaſt keeps free from pain or oppreſſion.

" It may be well to remember, that the poiſon itſelf is diſtinct from that groſs matter which is offenſive to the ſmell; and that this is frequently in its moſt active ſtate when undiſtinguiſhed by the ſenſe. Were the following cautions generally attended to, they might in ſome inſtances be the happy means of preſerving life. Never to be confined with burning charcoal in a ſmall room, or where there is not a free draught of air by a chimney or ſome other way. Never to venture into any place in which air has been long pent up, or which from other circumſtances ought to be ſuſpected; unleſs ſuch ſuſpected place be either previouſly well ventilated, or put to the teſt of the lighted candle. For it is a ſingular and well-known fact, that the life of flame is in ſome circumſtances ſooner affected and more expeditiouſly extinguiſhed by noxious vapours than animal-life. A proof of which I remember to have received from a very intelligent clergyman, who was preſent at a muſical entertainment in the theatre at Oxford. The theatre was crowded; and during the entertainment, the candles were obſerved to burn dim, and ſome of them went out. The audience complained only of faintneſs and languor; but had the animal effluvia been ſtill further accumulated or longer confined, they would have been extinguiſhed as well as the candles.

" The moſt obvious, effectual and expeditious means of relief to thoſe who have unhappily ſuffered from this cauſe, are ſuch as will diſlodge and waſh away the poiſon, reſtore the energy of the brain and nerves, and renew the vital motions. Let the patient therefore be immediately carried into the open air, and let the air be fanned backwards and forwards to aſſiſt its action: let cold water be thrown on the face; let the face, mouth, and noſtrils, be repeatedly waſhed; and as ſoon as practicable, get the patient to drink ſome cold water. But if the caſe be too far gone to be thus relieved, let a healthy perſon breathe into the mouth of the patient; and gently force air into the mouth, throat, and noſtrils. Frictions, cupping, bleeding, and bliſters, are likewiſe indicated. And if, after the inſtant danger is removed, a fever be excited, the method of cure muſt be adapted to the nature and prevailing ſymptoms of the fever."

With regard to the poiſon of opium, Dr Mead recommends the following method of cure. Beſides evacuations by vomiting, bleeding, and bliſtering, acid medicines and lixivial ſalts are proper. Theſe contract the relaxed fibres, and by their diuretic force make a depletion of the veſſels. Dr Mead ſays he hath given repeated doſes of a mixture of ſalt of wormwood and juice of lemons, with extraordinary ſucceſs. But nothing perhaps is of greater conſequence, than to uſe proper means for the prevention of ſleep, by rouſing and ſtiring the patient, and by forcing him to walk about; for if he be once permitted to fall into a ſound ſleep, it will be found altogether impoſſible to awake him.

Of a kind ſomewhat akin to the poiſon of opium ſeems to be that of laurel-water, a ſimple water diſtilled from the leaves of the lauro-ceraſus or common laurel. The bad effects of this were firſt obſerved in Ireland, where it had been cuſtomary to mix it with brandy for the ſake of the flavour; and thus two women were ſuddenly killed by it. This gave occaſion to ſome experiments upon dogs, in order to aſcertain the malignant qualities of the water in queſtion; and the event was as follows: All the dogs fell immediately into totterings and convulſions of the limbs, which were ſoon followed by a total paralyſis, ſo that no motion could be excited even by pricking or cutting them. No inflammation was found upon diſſection, in any of the internal membranes. The moſt remarkable thing was a great fulneſs and diſtenſion of the veins, in which the blood was ſo fluid, that even the lymph in its veſſels was generally found tinged with red. The ſame effects were produced by the water injected into the inteſtines by way of clyſter.

To make the experiment more fully, Dr Nicholls prepared ſome of this water ſo ſtrong, that about a drachm of heavy eſſential oil remained at the bottom of three pints of it, which by frequent ſhaking was again quite incorporated with it. So virulent was this water, that two ounces of it killed a middle-ſized dog in leſs than half a minute, even while it was paſſing down his throat. The poiſon appeared to reſide entirely in the abovementioned eſſential oil, which comes over by diſtillation, not only from the leaves of laurel, but from ſome other vegetables; for ten drops of a red oil diſtilled from bitter almonds, when mixed with half an ounce of water, and given to a dog, killed him in leſs than half an hour.

Volatile alkalies are found to be an antidote to this poiſon; of which Dr Mead gives the following inſtance. About an ounce of ſtrong laurel-water was given to a ſmall dog. He fell immediately into the moſt violent convulſions, which were ſoon followed by a total loſs of his limbs. When he ſeemed to be expiring, a vial of good ſpirit of ſal ammoniac was held to his noſe, and a ſmall quantity of the ſame forced down his throat: he inſtantly felt its virtue; and by continuing the uſe of it for ſome time, he by degrees recovered the motion of his legs; and in two hours walked about with tolerable ſtrength, and was afterwards quite well.

With regard to the pernicious effects of cold, there is no other way of counteracting them but by the application of external heat. We are apt to imagine, that the ſwallowing conſiderable quantities of ardent ſpirits may be a means of making us reſiſt the cold, and preventing the bad effects of it from ariſing to ſuch an height as to deſtroy life; but theſe do not appear to be in the leaſt poſſeſſed of any ſuch virtue in thoſe countries liable to great exceſſes of cold. The Peruvian bark, by ſtrengthening the ſolids, as well is increaſing the motion of the fluids, is found to anſwer better than any other thing as a preſervative: but when the pernicious effects have already begun to diſcover themſelves, nothing but increaſing by ſome means or other the heat of the body can poſſibly be depended upon: and even this muſt be attempted with great care; for as, in ſuch caſes, there is generally a tendency to mortification in ſome of the extremities, the ſudden application of heat will certainly increaſe this tendency to ſuch a degree as to deſtroy the parts. But for the external treatment of ſuch mortifications, ſee the article SURGERY.

Sp. VII. APOPLEXY from *Paſſions* of the *Mind*. 262

Carus a pathemate, *Sauv.* ſp. 11.
Aſphyxia a pathemate, *Sauv.* ſp. 7.
Ecſtaſis catoche, *Sauv.* ſp. 1.
Ecſtaſis reſoluta, *Sauv.* ſp. 2.

APOPLEXIES from violent paſſions may be either ſanguineous or ſerous, though more commonly of the former than the latter ſpecies. The treatment is the ſame in either caſe. Or they may partake of the nature of catalepſy; in which caſe the method of treatment is the ſame with that of the genuine catalepſy.

Sp. VIII. The *Cataleptic* APOPLEXY. 263

Catalepſis, *Sauv*, gen. 176. *Lin.* 129. *Vog.* 230. *Sag.* gen. 281. *Boerh.* 1036. *Junck.* 44.

Dr CULLEN ſays he has never ſeen the catalepſy except when counterfeited; and is of opinion that many of thoſe caſes related by other authors have alſo been counterfeited. It is ſaid to come on ſuddenly, being only preceded by ſome languor of body and mind; and to return by paroxyſms. The patients are ſaid to be for ſome minutes, ſometimes (though rarely) for ſome hours, deprived of their ſenſes, and all power of voluntary motions; but conſtantly retaining the poſition in which they were firſt ſeized, whether lying or ſitting; and if the limbs be put into any other poſture during the fit, they will keep the poſture in which they are placed. When they recover from the paroxyſm, they remember nothing of what paſſed during the time of it, but are like perſons awaked out of ſleep.—Concerning the cure of this diſorder we find nothing that can be depended upon among medical writers.

Sp. IX. APOPLEXY from *Suffocation*. 264

Aſphyxia ſuſpenſorum, *Sauv.* ſp. 4.
Aſphyxia immerſorum, *Sauv.* ſp. 1.

THIS is the kind of apoplexy which takes place in thoſe who are hanged or drowned. For the treatment of thoſe perſons, ſee the articles DROWNING and HANGING.

Beſides the ſpecies abovementioned, the apoplexy is a ſymptom in many other diſtempers, ſuch as fevers both continued and intermitting, exanthemata, hyſteria, epilepſy, gout, worms, iſchuria, and ſcurvy.

265 GENUS XLIII. PARALYSIS.
The PALSY.

Paralyſis, *Boerh.* 1057.
Hemiplegia, *Sauv.* gen. 170. *Lin.* 103. *Vog.* 220.
Paraplexia, *Sauv.* gen. 171.
Paraplegia, *Lin.* 102. *Vog.* 227.
Paralyſis, *Sauv.* gen. 169. *Lin.* 104. *Vog.* 226. *Junck.* 115.
Atonia, *Lin.* 120.

266 Sp. I. The *Partial PALSY*.

Paralyſis, *Sauv.* gen. 169. *Lin.* 104. *Vog.* 226. *Junck.* 115.
Paralyſis plethorica, *Sauv.* ſp. 1.
Paralyſis ſeroſa, *Sauv.* ſp. 12.
Paralyſis nervea, *Sauv.* ſp. 11.
Mutitas a gloſſolyſi, *Sauv.* ſp. 1.
Aphonia paralytica, *Sauv.* ſp. 8.

267 Sp. II. HEMIPLEGIA, or *PALSY of one ſide of the* Body.

Hemiplegia, *Sauv.* gen. 170. *Lin.* 108. *Vog.* 228. *Sag.* gen. 276.
Hemiplegia ex apoplexia, *Sauv.* ſp. 7.
Hemiplegia ſpaſmodica, *Sauv.* ſp. 2.
Hemiplegia ſeroſa, *Sauv.* ſp. 10.

268 Sp. III. PARAPLEGIA, or *PALSY of one half* of the Body taken *tranſverſely*.

Paraplexia, *Sauv.* gen. 171. *Sag.* gen. 277.
Paraplegia, *Lin.* 102. *Vog.* 227.
Paraplexia ſanguinea, *Sauv.* ſp. 2.
Paraplexia a ſpina bifida, *Sauv.* ſp. 3.
Paraplexia rheumatica, *Sauv.* ſp. 1.

Deſcription. The palſy under all the different forms here mentioned as particular ſpecies, ſhows itſelf by a ſudden loſs of tone and vital power in a certain part of the body. In the ſlighter degrees of the diſeaſe, it only affects a particular muſcle, as the ſphincter of the anus or bladder, thus occaſioning an involuntary diſcharge of excrements or of urine; of the muſcles of the tongue, which occaſions ſtammering, or loſs of ſpeech; of the muſcles of the larynx, by which the patient becomes unable to ſwallow ſolids, and ſometimes even liquids alſo.—In the higher degrees of the diſeaſe, the paralytic affection is diffuſed over a whole limb, as the foot, leg, hand, or arm; and ſometimes it affects a whole ſide of the body, in which caſe it is called *hemiphlegia;* and ſometimes, which is the moſt violent caſe, it affects all the parts below the waſte, or even below the head, though this laſt be exceedingly rare. In theſe violent caſes, the ſpeech is either very much impeded, or totally loſt. Convulſions often take place in the ſound ſide, with the cynic ſpaſm or involuntary laughter, and other diſtortions of the face. Sometimes the whole paralytic part of the body becomes livid, or even mortifies before the patient's death; and ſometimes the paralytic parts gradually decay and ſhrivel up, ſo as to become much leſs than before. Whether the diſeaſe be more or leſs extended, many different varieties may be obſerved in its form. Sometimes there occurs a total loſs of ſenſe while motion is entire; in others a total loſs of motion with very ſlight or even no affection of ſenſe; and in ſome caſes, while a total loſs of motion takes place in one ſide, a total loſs of ſenſe has been obſerved on the other. This depends entirely on the particular nerves or branches of nerves in which the affection is ſituated; loſs of ſenſe depending on an affection of the ſubcutaneous nerves; and loſs of motion on an affection of theſe leading to the muſcles.

Cauſes, &c. Palſies moſt commonly ſupervene upon the different ſpecies of coma, eſpecially the apoplexy. They are alſo occaſioned by any debilitating power applied to the body, eſpecially exceſſes in venery. Sometimes they are a kind of criſis to other diſtempers, as the colic of Poictou, and the apoplexy. The hemiplegia eſpecially often follows the laſt mentioned diſeaſe. Aged people, and thoſe who are by any other means debilitated, are ſubject to palſy; which will ſometimes alſo affect even infants, from the repulſion of exanthemata of various kinds. Palſies are alſo the infallible conſequences of injuries of the large nerves.

Prognoſis. Except in the ſlighter caſes of palſy, we have little room to hope for a cure; however, death does not immediately follow even the moſt ſevere paralytic affections. In an hemiphlegia it is not uncommon to ſee the patients live ſeveral years; and even in the paraplegia, if death do not enſue within two or three weeks, it may not take place for a conſiderable time. It is a promiſing ſign when the patient feels a ſlight degree of painful itchneſs in the affected parts; and if a fever ſhould ariſe, it bids fair to cure the palſy. When the ſenſe of feeling remains, there is much more room to hope for a cure than where it is gone, as well as the power of motion. But when we obſerve the fleſh to waſte, and the ſkin to appear withered and dry, we may look upon the diſeaſe to be incurable. Convulſions ſupervening on a palſy are a fatal ſign.

Cure. Many remedies have been recommended in palſies: but it muſt be confeſſed, that, except in the ſlighter caſes, medicines ſeldom prove effectual; and before any ſcheme of cure can be laid down, every circumſtance relative to the patient's habit of body and previous ſtate of health ſhould be carefully weighed. If an hemiplegia or paraplegia ſhould come on after an apoplexy, attended with thoſe circumſtances which phyſicians have ſuppoſed to denote a viſcid ſtate of the blood, a courſe of the attenuant gums, with fixed alkaline ſalts, and chalybeate waters, may do ſervice; to which it will be proper to add frictions with the volatile liniment all down the ſpine: but in habits where the blood is rather inclined to the watery ſtate, it will be neceſſary to give emetics from time to time; to apply bliſters, and cut iſſues.

The natural hot baths are often found uſeful in paralytic caſes; and where the patients cannot avail themſelves of theſe, an artificial bath may be tried by diſſolving ſalt of ſteel in water, and impegnating the water with fixed air. Frictions of the parts, and ſcourging them with nettles, have alſo been recommended, and may do ſervice, as well as volatile and ſtimulating medicines taken inwardly. And it is probably by operating in this manner, that the uſe of camphor, or a mercurial courſe continued for ſome length of time to ſuch a degree as gently to affect the mouth, have been found productive of a cure in obſtinate caſes of this affection, Of late years, an infuſion of the arnica montana or German leopard's bane, has been highly extolled in the cure of this diſeaſe by ſome foreign writers; but the trials made with it in Britain, particularly at Ediuburgh, have been by no means equally ſucceſsful with thoſe related by Dr Collins, who has ſtrongly recommended this medicine to the attention of the public.

269 Sp. IV. The Palsy from *Poiſons*.

Paralyſis metallariorum, *Sauv*. ſp. 22.
Hemiplegia ſaturnina, *Sauv*. ſp. 14.

This kind of palſy ariſes moſt frequently from lead taken into the body, and is a conſequence of the colica pictonum, under which it is more particularly treated.

274 TREMOR, or Trembling.

Tremor, *Sauv*. gen. 129. *Lin*. 139. *Vog*. 184. *Sag*. 236.

This by Dr Cullen is reckoned to be always ſymptomatic either of palſy, aſthenia, or convulſions; and therefore need not be treated of by itſelf.

271 Order II. ADYNAMIÆ.

Adynamiæ, *Vog*. Claſs VI.
Defectivi, *Lin*. Claſs VI. Order I.
Leipopſychiæ, *Sauv*. Claſs VI. Order IV. *Sag*. Claſs IX. Order IV.

272 Genus XLIV. SYNCOPE.

Fainting.

Syncope, *Sauv*. gen. 174. *Sag*. 94. *Vog*. 274. *Sag*. 280. *Junck*. 119.
Leipothymia, *Sauv*. gen. 173. *Lin*. 93. *Vog*. 273. *Sag*. 279.
Aſphyxia, *Sauv*, gen. 175. *Lin*. 95. *Vog*. 275. *Sag*. 281.
Virium lapſus et animi deliquia. *Hoffm*. III. 267.

273 Sp. I. The *Cardiac Syncope*.

Syncope plethorica, *Sauv*. ſp. 5. *Senac* Tr. de Cœur, p. 540.
Syncope a cardiogmo, *Sauv*. ſp. 7. *Senac*. de Cœur, 414. *Morgagn*. de Sed. XXV. 2. 3. 10.
Syncope a polypo. *Sauv*. ſp. 8. *Senac*. p. 471.
Syncope ab hydrochardia, *Sauv*. ſp. 12. *Senac*. 533. *Schreiber* Almag. L. III. § 196.
Syncope *Lanzoni*, *Sauv*. ſp. 18. *Lanzon*. Op. II. p. 462.
Aſphyxia Valſalviana, *Sauv*. ſp. 13.

274 Sp. II. *Occaſional Syncope*.

Leipothymia a pathemate, *Sauv*. ſp. 1. *Senac* p. 544.
Syncope pathetica, *Sauv*. ſp 21.
Aſphyxia a pathemate, *Sauv*. ſp. 7.
Syncope ab antipathia, *Sauv*. ſp. 9. *Senac*. p. 544.
Syncope a veneno, *Sauv* ſp. 10. *Senac*. p. 546.
Syncope ab apoſtematis, *Sauv*. ſp. 11. *Senac*. p. 554.
Syncope a ſphacelo, *Sauv*. ſp. 14. *Senac*. p. 553.
Syncope ab inantione, *Sauv*. ſp. 1. *Senac*. p. 536,
Syncope a phlebotomia, *Sauv*. ſp. 4.
Syncope a dolore, *Sauv*. ſp. 2. *Senac*. p. 583.
Aſphyxia traumatica, *Sauv*. ſp. 14.
Aſphyxia neophytorum, *Sauv*. ſp. 17.

Deſcription. A ſyncope begins with a remarkable anxiety about the heart; after which follows a ſudden extinction, as it were, not only of the animal powers and actions, but alſo of the vital powers, ſo that the patients are deprived of pulſe, ſenſe, and motion, all at once. In thoſe caſes which phyſicians have diſtinguiſhed by the name of *leipothymia*, the patient does not entirely loſe his ſenſes, but turns cold and pale; and the pulſe continues to beat, though weakly; the heart alſo ſeems to tremble rather than beat; and the reſpiration is juſt perceptible. But in the true ſyncope or full aſphyxia, not the ſmalleſt ſign of life can be perceived; the face hath a death-like paleneſs, the extremities are cold, the eyes ſhut, or at leaſt troubled; the mouth ſometimes ſhut, and ſometimes gaping wide open; the limbs flaccid, and the ſtrength quite gone; as ſoon as they begin to recover, they fetch deep and heavy ſighs.

Cauſes, &c. Fainting is occaſioned moſt commonly by profuſe evacuations, eſpecially of blood; but it may happen alſo from violent paſſions of the mind, from ſurfeits, exceſſive pain, &c. People of delicate conſtitutions are very ſubject to it from ſlight cauſes; and ſometimes it will ariſe from affections of the heart and large veſſels not eaſy to be underſtood. Fainting is alſo a ſymptom of many diſorders, eſpecially of that fatal one called a *polypus of the heart*, of the plague, and many putrid diſeaſes.

Prognoſis. When fainting happens in the beginning of any acute diſtemper, it is by no means a good omen; but when it takes place in the increaſe or at the height of the diſeaſe, the danger is ſomewhat leſs; but in general, when fainting comes on without any evident cauſe, it is to be dreaded. In violent hæmorrhagies it is favourable; as the bleeding veſſels thus have time to contract and recover themſelves, and thus the patient may eſcape.

Cure. When perſons of a full habit faint through exceſs of paſſion, they ought to be blooded without delay, and ſhould drink vinegar or lemon-juice diluted with water; and, after the bowels are emptied by a clyſter, take a paregoric draught, and go to bed.

The paſſion, of anger, in a peculiar manner, affects the biliary ſecretion, cauſes an oppreſſion at the ſtomach, with nauſea and retching to vomit, and a bitter taſte in the mouth, with giddineſs: theſe ſymptoms ſeem to indicate an emetic; which, however, in theſe caſes muſt be carefully avoided, as it might endanger the patient, by bringing on an inflammation of the ſtomach.

The general effects of a ſudden fright have been mentioned on a former occaſion. When theſe are ſo violent as to require medical aid, our firſt endeavours muſt be to take off the ſpaſmodic conſtriction, and reſtore freedom to the circulation; by bleeding, if the habit be at all inclined to fulneſs; and by giving a mixture, with equal parts of the vinum antimoniale and tinctura opii camphorata, in ſome agreeable vehicle, which will bring on ſleep and encourage perſpiration. It was formerly mentioned, that convulſions, or even an epilepſy, may be brought on by frights; which ſhould make people cautious of playing fooliſh tricks in this way.

When a ſurfeit, or any ſpecies of ſaburra, occaſions a leipothymia, an emetic is the immediate remedy, as ſoon as the patient, by the help of acrid ſtimulants, ſhall be ſo far rouſed as to be able to ſwallow one: in theſe caſes, tickling the fauces with a feather dipt in ſpirit of hartſhorn, will be proper, not only to rouſe the patient, but alſo to bring on vomiting.

A ſyncope is moſt commonly brought on by profuſe diſcharges or evacuations, either of the blood or of the ſecreted humours.

In order to revive the patients, they ought to be laid along in a horizontal poſture, in an airy place; the legs, thighs, and arms, are to be rubbed with hot flannels; very ſtrong vinegar, or ſalt of hartſhorn, or volatile alkaline ſpirit, are to be held to the noſtrils, and rubbed into them; or, being properly diluted, poured down the throat; cold water is to be ſprinkled on the face and neck; and when by theſe means the patient ſhall be ſufficiently revived, wine boiled up with ſome grateful aromatic, is to be given in the proper quantity.

In the fainting conſequent upon profuſe uterine hæmorrhagies, it will be a ſafer practice to abſtain from all heating and ſtimulant things; as life, in theſe caſes, is preſerved by the coagulation of the blood in the extremities of the open veſſels; which might be prevented by the pouring in hot wine or volatile alkaline ſpirits.

When a ſyncope is the conſequence of the too violent operation of either an emetic or cathartic, the tinctura thebaica, mixed with ſpiced wine, is the moſt efficacious remedy; but the opiate muſt be given gradually, and in very ſmall doſes.

A ſyncope, or even aſphyxia, wherein the patient ſhall lie for ſeveral hours, is frequent in hyſteric conſtitutions; and during the fit requires fetid antiſpaſmodics, together with acrid ſtimulants: to prevent returns, nothing anſwers better than the Peruvian bark joined with chalybeates.

275 GENUS XLV. DYSPEPSIA.

Depraved DIGESTION

Dyſpepſia, *Vog.* 277.
Apepſia, *Vog.* 276.
Diaphora, *Vog.* 278.
Anorexia, *Sauv.* gen. 162. *Lin.* 116. *Sag.* gen. 286.
Cardialgia, *Sauv.* gen. 202. *Lin.* 48. *Vog.* 157. *Sag.* gen. 160.
Gaſtrodynia, *Sauv.* gen. 203. *Sag.* gen. 161.
Soda, *Lin.* 47. *Vog* 161.
Nauſea, *Sauv.* gen. 250. *Lin.* 182. *Vog.* 159. *Sag.* gen. 185.
Vomitus, *Sauv.* gen. 251. *Lin* 183. *Vog.* 214. *Sag.* gen. 186.
Flatulentia, *Sauv.* gen. 272. *Lin.* 165. *Vog.* 127. *Sag.* gen. 207.

The idiopathic ſpecies are,

Anorexia pituitoſa. *Sauv.* ſp. 2.
Anorexia a ſaburra, *Sauv.* ſp. 9.
Anorexia exhauſtorum, *Sauv.* ſp. 8.
Anorexia paralytica, *Sauv.* ſp. 1.
Nauſea ex cacochylia, *Sauv.* ſp. 11.
Vomitus pituitoſus, *Sauv.* ſp. 26.
Vomitus ruminatio, *Sauv.* ſp. 6.
Vomitus a ſaburra, *Sauv.* ſp. 2.
Vomitus a crapula, *Sauv.* ſp. 1.
Vomitus lacteus, *Sauv.* ſp. 3.
Flatulentia infantilis, *Sauv.* ſp. 5.
Flatulentia acida, *Sauv.* ſp. 1.
Flatulentia nidroſa, *Sauv.* ſp. 2.
Cardialgia bradypepta, *Sauv.* ſp. 9.
Cardialgia a ſaburra, *Sauv.* ſp. 2.
Cardialgia lactantium, *Sauv.* ſp. 11.
Cardialgia flatulenta, *Sauv.* ſp. 3.
Cardialgia paralytica, *Sauv.* ſp. 7.
Gaſtrodynia ſaburralis, *Sauv.* ſp. 1.
Gaſtrodynia flatulenta, *Sauv.* ſp. 2.
Gaſtrodynia periodynia, *Sauv.* ſp. 7.
Gaſtrodynia aſtringens, *Sauv.* ſp. 9.
Gaſtrodynia atterens, *Sauv.* ſp. 10.
Gaſtrodynia a frigore, *Sauv.* ſp. 18.

Beſides theſe there are a great number of ſymptomatic ſpecies.

Deſcription. It is by no means eaſy to define exactly the diſtemper called *dyſpepſia*, when conſidered as an original diſeaſe, as there are very few maladies which ſome way or other do not ſhow themſelves by an affection of the ſtomach; and much more difficult ſtill muſt it be to enumerate all its ſymptoms. The moſt remarkable, however, and the moſt common, are the following: Want of appetite; diſtenſion of the ſtomach when no food has been taken for ſome time before; ſlight dejection of ſpirits; a gradual decay of the muſcular ſtrength; languor, and averſion from motion; the food which is taken without appetite is not well digeſted; the ſtomach and inteſtines are much diſtended with flatus, whence the patients are tormented with ſpaſms, gripes, and ſickneſs: frequently a limpid water, having an acid or putrid taſte, is brought up; ſometimes the food itſelf is thrown up by mouthfuls; and ſometimes, though rarely, the ſame is ſwallowed again, after the manner of ruminating animals. While matters are in this ſituation, the heart ſometimes palpitates, and the breath is quick, and drawn with difficulty; the head achs and is giddy; and ſometimes both theſe ſymptoms are continual, and very violent, inſomuch that the patient is not only tormented with pain, but ſtaggers as if he was drunk. From the too great aceſcency or putrefaction of the aliment, a cardialgia or heartburn comes on; and in this ſituation a ſpontaneous diarrhœa ſometimes carries off the diſeaſe; but in other caſes there is an obſtinate coſtiveneſs, attended with colic-pains. Frequently the pulſe is quick, ſometimes ſlow, but always weak: the circulation is ſo languid, that the blood can ſcarce reach the extreme veſſels, or at leaſt ſtagnates in them, ſo that the face becomes livid, ſwelled, and has an unuſual appearance: and at the ſame time that the circulation and nervous power are in this languid ſtate, the perſpiration becomes leſs copious, the ſkin becomes dry and corrugated; the natural heat, eſpecially of the extremities, is much diminiſhed; the tongue is white; and an univerſal laxity takes place, inſomuch that the uvula and velum pendulum palati are ſometimes enlarged to ſuch a degree as to become extremely troubleſome. The patient is either deprived of reſt or wakes ſuddenly out of his ſleep, and is diſturbed by frightful dreams; at the ſame time that the mind ſeems to be affected as well as the body, and he becomes peeviſh, fretful, and incapable of paying attention to any thing as uſual. At laſt hectic ſymptoms come on, and the whole frame becomes ſo irritable, that the ſlighteſt cauſe excites an univerſal tremor, and ſometimes violent vomiting and diarrhœa. Sometimes the ſalivary glands are ſo relaxed, that a ſalivation comes on as if excited by mercury; the ſerum is poured out into the cavity of the abdomen and cellular ſubſtance of the whole body, and the patient becomes affected with anaſarca or aſcites.

Cauſes &c. The cauſes of dyſpepſia may be any thing which debilitates the ſyſtem in general, but in a particular manner affects the ſtomach. Such are opium taken in immoderate quantities, which hurts by its ſedative and relaxing powers; ſpirituous liquors drunk to exceſs; tobacco, tea, coffee, or any warm relaxing liquor, taken in too great quantity; acid, unripe fruits; vomits or purges too frequently taken; an indolent ſedentary life, &c. &c. All theſe act chiefly upon people of a weak and delicate habit; for the robuſt and hardy ſeldom labour under a dyſpepſia, or at moſt a very ſlight one.

Prognoſis. When a dyſpepſia firſt occurs, it is frequently removed without great difficulty; when it is ſymptomatic, we muſt endeavour to cure the primary diſeaſe; and without this we cannot expect a complete removal of the affection: but when it frequently returns with ſymptoms of great debility, hectic fever, or dropſy, we have great reaſon to dread the event.

Cure. A radical cure of dyſpepſia is only to be expected by removing from the ſtomach and ſyſtem that debility on which the diſeaſe depends. On this ground, the objects chiefly to be aimed at in the cure are, 1ſt, The avoiding whatever will tend to diminiſh the vigour of the ſtomach; 2d, The employing ſuch remedies as have influence in encreaſing that vigour; and, in the third place, The obviating urgent ſymptoms, particularly thoſe which tend to increaſe and ſupport the affection. Of the avoiding cauſes, which tend to diminiſh the vigour of the ſtomach, after what has already been ſaid of the cauſes inducing the diſeaſe, it is unneceſſary to make any farther obſervations; and indeed every dyſpeptic patient will be taught by experience what is to be done with this intention. The medicines chiefly employed with the view of increaſing vigour are thoſe of the tonic kind: but, previous to their uſe, it will be neceſſary to evacuate the contents of the alimentary canal by vomits or purgatives. If there be a tendency to putreſcency, antiſeptics muſt then be exhibited; but more frequently there is a prevailing acidity, which creates an intolerable heart-burn. To palliate this ſymptom, magneſia alba may be given; which is much preferable to the common teſtaceous powders, as being purgative while diſſolved in an acid, when the others are rather aſtringent. In the third volume of the Medical Obſervations, we have an account of two caſes of dyſpepſia attended with a very uncommon degree of cardialgia, in which magneſia was ſo ſucceſsful, that we can ſcarce doubt of its efficacy in ſlighter degrees of the diſorder. They were communicated by Dr Watſon.

“ A woman, aged 34, the mother of ſeveral children, was taken, in the fourth month of her pregnancy, with violent vomitings; which growing daily worſe, notwithſtanding the endeavours of her apothecary to reſtrain them, brought on at the end of a month ſuch ſevere pains in the ſtomach, and ſpaſms in her abdomen, as to occaſion abortion. The vomitings were not leſſened by this event, but grew worſe and frequently brought on general convulſions to ſuch a degree, that ſhe was many times ſuppoſed to be at the point of death.

“ Scarce any medicine ſtaid with her; ſhe brought up almoſt inſtantly whatever was given her as nouriſhment, either in a ſolid or a liquid form. She was exceedingly pale, and very much emaciated; her fleſh was cold to the touch; and, though her urine was little in quantity, it was perfectly limpid. She had a continual thirſt, and was, in a conſiderable degree, coſtive. Her pulſe was low and quick, and ſhe was frequently tormented with the hiccough. The pain in her ſtomach was ſevere and conſtant; and whatever ſhe brought up was ſharp to ſuch a degree as to make her mouth and throat very ſore. Theſe parts upon examination appeared high-coloured, and in many places excoriated; and the pain ſhe felt in her ſtomach upon ſwallowing any liquor that had the leaſt degree of acrimony, or was more than luke-warm, made it probable the ſtomach itſelf, in its internal ſurface, was affected in the ſame manner.

“ In this wretched ſtate I was conſulted; and muſt confeſs that I was much at a loſs how to relieve a patient ſo debilitated, and whoſe ſtomach was in ſo diſeaſed a ſtate, that it ſeemed incapable of retaining any appropriated remedies long enough to correct the acrimony of the juices, and reſtore the ſecretions to a more mild and natural ſtate. Anti-emetics of various kinds had been tried without effect, particularly ſaturated ſolutions of alkaline ſalt in juice of lemons. Stomachic medicines of the warm and aromatic kind ſhe could not bear, on account of their poignancy; and, though nothing could ſo ſpeedily correct the almoſt cauſtic acid of the gaſtric juice as ſolutions of alkaline ſalts, neither the fauces nor gullet could bear their acrimony.

“ My expectations of relieving this patient, ſmall as they were, depended upon my being able to neutralize, and thereby leſſen, the ſtimulus of the acid of the ſtomach. To accompliſh this was not very eaſy, as no medicine in ſmall doſes could in any conſiderable degree correct ſo intenſe an acid; and, in the preſent ſituation, it was difficult to get any medicine to ſtay long enough to exert its effects. To diſcharge however what acrid matter might be already accumulated

Adynamiæ

in the ſtomach, I directed that the patient ſhould drink plentifully of ſmall, warm, unſalted mutton-broth, and vomit with it ſo long that it ſhould be diſcharged with no other taſte than that of broth. This was complied with, and a large quantity drank. The pain in her ſtomach ceaſed upon this for more than two hours, and was after that time apparently coming on with the ſame violence as before. Upon which I ordered a drachm of magneſia to be given in two ounces of veal-broth. This kept down, and eaſed her; I therefore directed the ſame doſe to be repeated as often as the pain returned, without any regard to the quantity that the whole might amount to, ſuppoſing that the pain continued ſevere. This was done; and in three days ſhe took three ounces of magneſia, of which very few doſes were vomited up, and ſhe was purged conſiderably.

"This medicine was continued in a ſomewhat leſs quantity for three days longer, in which ſhe took two ounces more of magneſia; by this time the vomitings ceaſed, the convulſions left her, ſhe had no pains in the ſtomach, and her mouth and fauces loſt their intenſely red colour and ſoreneſs; nor did even her eructations longer indicate any acidity.

"Beſides veal-broth ſhe was allowed boiled rice, and now and then ſome rice gruel with a ſmall quantity of brandy; and after a few days more ſhe could retain boiled chicken, and other light, ſolid, animal-food.

"When her ſtomach was in this ſtate, ſhe took liberally of *decoct cort. Peruvian*, with a ſmall portion of French brandy; by which and her nouriſhment ſhe recovered her ſtrength ſurpriſingly. To this medicine, as ſhe was during the latter part of her illneſs conſiderably anaſarcous, were added ſome preparations of ſteel; and in about a month ſhe perfectly recovered.

"When this patient's ſtomach was relieved, the thirſt, the general and partial ſpaſms, and other complaints, which were merely ſymptomatic, ſoon ceaſed; and what remained of her cure was by no means difficult.

"Since the above-recited caſe, I was conſulted in another almoſt in every reſpect ſimilar, except that the former began in pregnancy. The vomitings attended with acidity had continued more than a month; the patient's ſtomach rejected every kind of food and medicine; ſhe was debilitated to a great degree, and univerſally anaſarcous.

"Upon being ſent for, I directed for her magneſia, much in the ſame manner as for the former patient; and in a very few days her vomitings ceaſed, her ſtomach became ſtronger, and in leſs than a fortnight the anaſacra diſappeared. But it was a conſiderable time, as this perſon was more advanced in years than the former, before ſhe recovered her ſtrength, notwithſtanding my beſt endeavours for that purpoſe. She at length, however, perfectly recovered."

But although acidity may often be ſucceſsfully obviated in this manner, yet the beſt way of counteracting this ſymptom, as well as of obviating coſtiveneſs, flatulence, and a variety of others, is by reſtoring the tone of the ſtomach in particular, and indeed of the ſyſtem in general. With this intention, recourſe is had to a variety of tonics both from the mineral and vegetable kingdom; particularly chalybeates in different forms, gentian, colombo, and the like; but of all the tonics which can be employed in this affection, none are attended with greater benefit than exerciſe and cold bathing; and the proper and prudent employment of theſe is no leſs effectual in removing the diſeaſe, than in preventing the return of it after it is once removed.

Dyſpepſia.

Genus XLVI. HYPOCHONDRIASIS. 276

Hypochondriac Affection.

Hypochondriaſis, *Sauv.* gen. 220. *Lin.* 76. *Vog.* 218. *Sag.* 332.

Morbus hypochondriacus, *Boerh.* 1098.

Malum hypochondriacum, *Hoffm.* III. 65. *Junck.* 36.

Although ſome of the noſological writers, particularly Sauvages, have conſidered this genus as conſiſting of different ſpecies, Dr Cullen is of opinion, that there is only one idiopathic ſpecies, the *hypochondriaſis melancholica.* He conſiders not only the hypochondriaſis hyſterica, phthiſica, and aſthmatica, but alſo the biliosa, ſanguinea, and pituitoſa, as being only ſymptomatic; but he views the true melancholic hypochondriaſis as being a proper idiopathic diſeaſe, perfectly diſtinct from hyſteria, with which it has often been confounded.

Deſcription. The ſymptoms of hypochondriaſis are, ſtretching, preſſing, griping, and tormenting pains, under the ribs, and chiefly in the left ſide; which ſometimes are exaſperated, and become pungent, burning, or lancinating. Frequently there is an inflation of the left hypochondriacum, which ſometimes becomes ſtationary, and by Hippocrates was taken for a ſymptom of an enlarged ſpleen. When theſe ſymptoms take place in the right hypochondrium, they are commonly attended with colic-pains, uncertain flying heats, eſpecially in the head, with a tranſient redneſs of the face, and very frequently an œdematous ſwelling of the feet ſucceeds. To theſe are ſuperadded almoſt all the affections of the ſtomach occurring in dyſpepſia, beſides a variety of other ſymptoms, ſuch as palpitations, ſleepleſs nights, and the like. But beſides theſe, there occurs alſo a particular depreſſion of ſpirit and apprehenſion of danger which may be conſidered as one of the great characteriſing ſymptoms of the diſeaſe.

Cauſes, &c. The general cauſes of the hypochondriac affection are ſaid to be a plethora, and preternatural thickneſs of the blood; ſuppreſſions of cuſtomary evacuations; high and full diet, together with a ſparing quantity of drink; an hereditary diſpoſition; indolence; atony of the inteſtines; violent paſſions of the mind, &c.

Prognoſis. The hypochondriac affection, when left to itſelf, is more troubleſome than dangerous; but, if improperly treated, it may bring on various diſeaſes of a more fatal tendency, ſuch as the melancholy, bloody urine and nephritis, jaundice, vertigo, palſy, apoplexy, &c.

Cure. This is to be attempted by ſuch medicines as counteract occaſional cauſes, and obviate urgent ſymptoms, Adynamiæ symptoms, which may be all comprehended under bleeding, gentle evacuants, chalybeates, the Peruvian bark, and exerciſe, eſpecially riding on horſeback, which in this diſeaſe is greatly preferable to any other. When the circumſtances of the patient can afford it, a voyage to Spain, Portugal, or ſome of the warmer countries in Europe, will be of great ſervice.

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GENUS XLVII. CHLOROSIS.

GREEN SICKNESS.

Chloroſis, *Sauv.* gen. 309. *Lin.* 222. *Vog.* 305. *Sag.* gen. 135. *Boerh.* 1285. *Hoffm.* iii. 311. *Junck.* 86.

Of this genus alſo Dr Cullen thinks there is but one idiopathic ſpecies: viz. what ſome diſtinguiſh by the title of *chloroſis virginea,* others of *chloroſis amatoria.*

Deſcription. This diſeaſe uſually attacks girls a little after the time of puberty, and firſt ſhows itſelf by ſymptoms of dyſpepſia. But a diſtinguiſhing ſymptom is, that the appetite is entirely vitiated, and the patient will eat lime, chalk, aſhes, ſalt, &c. very greedily; while at the ſame time there is not only a total inappetence to proper food, but it will even excite nauſea and vomiting. In the beginning of the diſeaſe, the urine is pale, and afterwards turbid; the face becomes pale, and then aſſumes a greeniſh colour; ſometimes it becomes livid or yellow: the eyes are ſunk, and have a livid circle round them; the lips loſe their fine red colour; the pulſe is quick, weak, and low, though the heat is little ſhort of a fever, but the veins are ſcarcely filled; the feet are frequently cold, ſwell at night, and the whole body ſeems covered with a ſoft ſwelling; the breathing is difficult: nor is the mind free from affection as well as the body; it becomes irritated by the ſlighteſt cauſes; and ſometimes the patients love ſolitude, become ſad and thoughtful. There is a retention of the menſes throughout the whole courſe of the diſorder; and at laſt all the bad ſymptoms increaſing, a leucophlegmaſia, anaſarca, atrophy, and death, ſucceed.

Cauſes. The cauſe of chloroſis is thought to be an atony of the muſcular fibres of the alimentary canal, eſpecially of the ſtomach, joined with a ſimilar atony of the perſpiratory veſſels over the whole ſurface of the body, and the whole depending on an atony of thoſe ſmall arteries which pour out the menſtrual blood. This atony may be occaſioned by the ſame cauſes which bring on dyſpepſia and hypochondriaſis, but very frequently ariſes from love and other paſſions of the mind.

Prognoſis. The chloroſis in all caſes is tedious, though it does not generally prove fatal; but we can never promiſe a certain cure unleſs the menſes make their appearance.

Cure. The remedies here in general are the ſame as in the dyſpepſia and hypochondriaſis; only in the chloroſis ſtronger purgatives may be made uſe of: thoſe which ſtimulate the rectum are uſeful by ſtimulating alſo the veſſels of the uterus; and for this reaſon indulgence in venery has ſometimes been ſaid to produce a cure, particularly with love-ſick maids. The cold bath is alſo extremely proper.

Tetanus.

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Order III. SPASMI.

SPASMI, *Sauv.* Claſs IV. *Vog.* Claſs V. *Sag.* Claſs VIII.
Motorii, *Lin.* Claſs VII.
Morbi ſpaſmodici et convulſivi, *Hoffm.* III. 9.
Spaſmi et convulſiones, *Junck.* 45, 54.
Epilepſia, *Boerh.* 1071, 1088.

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GENUS XLVIII. The TETANUS.

Tetanus, *Sauv.* gen. 122. *Lin.* 127. *Vog.* 180. *Sag.* gen. 228.
Catochus, *Sauv.* gen. 123. *Lin.* 128.. *Vog.* 183. *Sag.* gen. 229.
Opiſthotonos, *Vog.* 181.
Epiſthotonos, *Vog.* 182.

On this diſtemper Dr Lionel Chalmers has publiſhed a diſſertation in the firſt volume of the Medical Obſervations, which being ſuperior to any thing that has appeared in other medical writers on the ſubject, we ſhall here lay before the reader,

" Of all the diſeaſes to which man is ſubject, none deſerves more to be conſidered than the opiſthotonos and tetanus, either with regard to the variety of painful ſymptoms which almoſt without intermiſſion diſtract the ſick, or the danger of the diſeaſes themſelves, from which few recover, in compariſon of the number they attack. In both, the vital actions are very imperfectly performed, moſt of thoſe which are called *natural* being as it were ſuſpended at once; and ſo far is the patient from being able to execute any voluntary motion, that the whole machine undergoes the moſt excruciating diſtortions, from the violent and unnatural contractions of the muſcles. Happy it is for the inhabitants of the more temperate climates, that ſuch diſeaſes appear rarely among them; but in thoſe countries which lie in the more ſouthern and warmer latitudes, they are endemic, eſpecially to negro ſlaves. In South Carolina, they ſhow themſelves at all ſeaſons, but not ſo often in winter, more frequently in ſpring and autumn; and are moſt common in the ſummer, when people work abroad and are alternately expoſed to the ſcorching heat of the ſun and heavy ſhowers, which often happen ſuddenly, and greatly alter the temperature of the air. Others are ſeized with the opiſthotonos after ſleeping without doors, that they may enjoy the deceitful refreſhment of the cool night-air, when the weather is warm: one youth choſe to cut off his hair and ſhave his head on a warm day in March, and went to bed without a cap; but the weather changed, and became cold in the night, and he was found rigid with that diſeaſe next morning.

" Theſe diſeaſes ſo rarely appear as originals in Europe, that a good hiſtory of them cannot be expected from the phyſicians who practice in that part of the world; nor has any thing like a full deſcription been given of them by any ancient or modern author which I have ſeen. Hippocrates indeed takes notice of them in many places, and ſeems to regard them only as conſequences of other diſeaſes, or of wounds or ulcers of the nervous or tendinous parts, of which ſymptomatic kind of opiſthotonos he gives three remarkable caſes in *lib.* V. § VII. *de. Morb. vulg.* and repeats them in another place; but the few ſymptoms he recounts do not ſhow themſelves with us. Galen, Cœlius Aurelianus, Aretæus, &c. ſeem only to have copied Hippocrates, with the addition of ſome ſuppoſititious ſymptoms, which really do not appear; and the little that Bontius ſays of it is very faulty.

"Among the numerous claſs of ſpaſmodic diſeaſes, there are three which diſtinguiſh themſelves in a very particular manner, on which the names of *emproſthotonos*, *opiſthotonos*, and *tetanus*, have been juſtly enough beſtowed, as being expreſſive of the poſture into which they throw and confine the patient. When therefore thoſe muſcles which bend the head, neck, and body forwards, ſuffer ſuch involuntary, violent, and continued contractions, as to fix the chin to the breaſt, incurvate the ſpine and body, and retain the ſick in this painful and prone poſture, the diſeaſe is called *emproſthotonos*. When the poſterior muſcles are ſimilary affected, ſo that the head is drawn towards the ſpine, and the ſpine itſelf is recurvated, it has then the name of *opiſthotonos*; although in fact, in this, all thoſe muſcles which act in deglutition, bend the head forwards, or turn it to either ſide, are equally contracted with thoſe which raiſe the head and ſpine. The *tetanus* differs from, or rather is compounded of, both the others; for in this the patient is found rigid and inflexible, being as it were braced between the oppoſite contractions of the anterior and poſterior muſcles; yet even here the head is much retracted.

"I never ſaw the *emproſthotonos*; and ſhall only ſpeak of the *opiſthotonos* and *tetanus*, the firſt being by far the moſt common, and in the laſt ſtage of which the tetanus frequently ſupervenes. And let it be obſerved, that the following deſcription by no means reſpects ſuch ſymptomatic contractions as often happen immediately before death, both in acute and chronic diſeaſes; neither will it agree with that ſpurious *opiſthotonos* or *tetanus* which appear ſometimes in the firſt and ſecond ſtages of quotidian intermittents in this country, however they may emulate the true diſeaſes in ſome of their ſymptoms.

"Stad. I. The *opiſthotonos*, contrary to what Bontius aſſerts, often comes on gradually and by ſlight approaches, the patient complaining rather of an uneaſy ſtiffneſs in the back-part of the neck and about the ſhoulders, than of any acute pain, with ſome degree of a general laſſitude. Theſe increaſe, and become ſo troubelſome when he attempts to turn his head, or to bend it forward, as to oblige him to walk very erect; for he can by no means look downward nor to either ſide, without turning his whole body. He cannot open his jaws without pain; and has ſome difficulty in ſwallowing, which diſcourages him from attempting to eat. At times he feels a ſudden and painful traction under the *cartilago enſiformis*, which ſtrikes thro' to the back and inſtantly increaſes the rigidity about the neck and ſhoulders, draws the head backwards a little, and ſhuts the jaws cloſer. The pain under the *ſternum* returns more frequently and with greater violence; and the other contractions become ſo ſtrong, that the head from this time continues much retracted, and he now refuſes nouriſhment, as ſwallowing is attended with great pain, and occaſions a return of the ſpaſm; which extends along the ſpine quite to the lower extremities, ſo that they will no longer ſupport him, and he is under the neceſſity of going to bed.

"In this manner paſſes over the firſt ſtage of the *opioſthotonos*, which ſometimes takes up three or four days; the patient, as well as thoſe about him, miſtaking the firſt appearances of it for that rheumatic complaint, which is commonly called a *crick in the neck*; but it ſometimes forms itſelf much quicker and invades the unfortunate perſon with the whole train of its miſchievous ſymptoms in a few hours: in which caſe, the danger may truly be eſtimated from the violence of the firſt attack; for ſuch generally die in 24, 36, or 48 hours, and very rarely ſurvive the third day. But when it is leſs acute, few are loſt after the ninth or eleventh; which number of days it would not be poſſible for them to complete, unleſs the violence of the diſeaſe was in a good meaſure ſubdued; although I had one who recovered, after having been ſubject to its tyrannical attacks daily for ſix weeks. In this ſtage the pulſe is ſlow, and very hard, and the belly is bound; blood taken away ſeems not to be altered from the natural ſtate, ſo that no indication can be deduced therefrom, and it only varies with regard to laxity or compaction, according to the age of the perſon and ſeaſon of the year.

"Stad. II. The ſpaſm under the ſternum (which is the pathognomic ſymptom of this diſeaſe) becomes more violent, returning every 10 or 15 minutes; and never fails to be inſtantly ſucceeded by a ſtronger retraction of the head, with great rigidity and pain all round the neck, and along the ſpine to the lower extremities which are ſuddenly put to the ſtretch. The countenance is very pale and contracted; the jaws are that moment ſnapped together, and cannot afterwads be opened ſo wide as to receive the end of one's little finger; an attempt to do which, by way of experiment, ſurely hurries on the ſpaſm. The maſtoid, coracohyoid and ſternohyoid muſcles, as well as all the others concerned in deglutition, and the deltoid and pectorals, are moſt violently contracted, ſo that the ſhoulders are ſtrongly raiſed forward, and the arms are ſtretched out or drawn acroſs the body; but the wriſts and fingers ſeem not to be affected.

"Such is the condition of the patient in the time of the ſpaſm, which ceaſes in a few ſeconds: after which the ſhoulders and arms recline, and the inferior extremities relax; yet not ſo entirely, but that ſuch a degree of rigidity for the moſt part remains as will not permit them to bend when this is attempted by another perſon; for as to the ſick himſelf, he cannot at all move them. The muſcles on the ſides and forepart of the neck continue ſtill contracted, although not ſo ſtrongly; but their action is overcome by the number and ſtrength of the poſterior ones; ſo that the retraction of the head conſtantly remains. He breathes quick for ſome minutes, as if he had been exceſſively exerciſed; and the pulſe is ſmall, fluttering, and irregular, but both become more calm and ſlow. The face is ſometimes pale in the intervals, but oftener fluſhed; and the whole countenance expreſſes ſtrong appearances of the moſt melancholy diſtreſs, as well becauſe of the dread he has of a return of the ſpaſm, which he is ſure will ſoon happen, as from the pain he ſuffers by the preſent contractions, and the more general

Spaſmi.

general and ſevere ones which he has ſo lately ſuſtained. The tongue is ſtiff and torpid; but ſo far as it can be ſeen, is not foul. The belly is always bound, and cannot eaſily be looſened. In drinking, the liquid paſſes with great difficulty to the ſtomach, even in the ſmalleſt quantity; and if the ſpaſm ſhould ſeize him at that time, which an attempt to ſwallow for the moſt part occaſions, the liquor returns through the noſe with ſome force. The patients deſire to lie ſtill as much as poſſible; and avoid drinking, ſpeaking, or being moved, either of which are apt to occaſion a return of the ſpaſm.

"Stad. III. In this laſt ſtage, the patient is reduced to the moſt calamitous and diſtreſsful circumſtances: for he is on a continual rack, according to the moſt literal meaning of that word; the ſpaſm returning oftener than once in a minute, is much more violent, and holds him longer, ſo that he has ſcarcely any remiſſion. The anterior muſcles of the whole body now ſuffer equal contractions with the poſterior; but the laſt overcome the force of the others, ſo that the ſpine is ſtrongly recurvated, and forms a hollow arch with the bed, and he reſts on the back part of the head and the heels. The belly is flat, and is drawn inward; and the muſcles are ſo rigidly contracted, that they will not give way to preſſure, and do not ſeem in the leaſt to yield to the deſcent of the diaphragm in inſpiration; the ſeveral muſcles about the neck, ſides, and abdomen, being plainly diſtinguiſhable from each other. Although the lower extremities are always rigid in this ſtate, yet are they ſo ſuddenly and violently diſtended in the time of the ſpaſms, that were it not for the ſtanders-by, he would be projected feet foremoſt off the bed; while others again are as it were puſhed upward with ſuch a ſpring, that the head is ſtruck with great force againſt whatever happens to be in the way, the thighs and legs being in this caſe no leſs rigid than the other parts. The tongue is ſpaſmodically darted out, and is often miſerably torn, as the teeth are that moment ſnapped together; ſo that it is neceſſary to prevent this by keeping the handle of a ſpoon, wrapped round with ſoft rags, between the teeth, when this can be done. At the time that the tongue is thus thruſt out, the muſcular fleſh, which lies between the arch of the lower jaw and head of the trachea, ſeems to be drawn upwards within the throat. The countenance is very much contracted, and he is in a foam of ſweat, the heat being very great; and the pulſe between the ſpaſms is exceeding quick, ſmall, and irregular, although the heart throbs ſo ſtrongly, that its motions may be plainly ſeen, and a palpitating ſubſultory kind of undulation may not only be felt, but perceived all over the epigaſtric region. The eyes are watery and languid, and a pale or bloody froth bubbles out from between the lips. The jaws are for the moſt part locked faſt, ſo that it is impoſſible to give drink or nouriſhment, nor could he ſwallow if any thing was put into his mouth. In this ſtate they are commonly delirious: and as they cannot ſubſiſt many hours under ſo great a ſuſpenſion of the vital and natural functions, a mortal anxiety enſues and releaſes them; oftener a continued and ſevere ſpaſm finiſhes the tragedy, when it was before almoſt at an end: but moſt frequently a general convulſion puts a period to their ſufferings; and whichever way this happens, they for the moſt part relax juſt before death.

Tetanus.

"In the *tetanus*, the general ſymptoms are nearly the ſame as in the opiſthotonos, except that from the firſt attack, the lateral, abdominal, and other anterior muſcles, are equally contracted with the poſterior ones; and the arms become rigid as well as the lower extremities. The abdomen is always flat and rigid as in the laſt ſtage of the opiſthotonos, and its contents ſeem to be thruſt up into the thorax, which at the ſame time appears to be much dilated. There are here alſo ſome intervals between the ſpaſms, in the time of which the cheeks are drawn towards the ears, ſo that all the teeth may be ſeen as in the ſpaſmus cynicus. Deglutition is more free in this than in the other diſeaſe; yet ſo far is the ſick from being equally balanced between the contractions of the oppoſite muſcles, that the head is retracted and the ſpine is recurvated, although not quite ſo much as in the opiſthotonos. And the ſpaſm, which commences under the ſternum, is likewiſe common to the tetanus, which terminates as the other, and on the ſame fatal days. But whoever recovers from either, labours long under a general atonia; and they cannot for ſome months raiſe themſelves from a ſupine or recumbent poſture without pain, nor without help for ſome time."

Prognoſis and Cure. There has never been any thing like a criſis obſerved in theſe frightful caſes, or favourable termination from the mere efforts of nature; and therefore all the phyſician's dependence muſt be upon art. As in caſes of tetanic affections, the diſeaſe often ariſes from ſome particular irritation, the removal of this muſt neceſſarily be an important object in the cure: But where it cannot be removed, benefit may often be obtained by the prevention of its influence being communicated to the brain. When, however, that influence is communicated to the brain, a cure is to be expected only by diminiſhing and obviating it. This is principally brought about by the uſe either of thoſe means which have a general tendency to diminiſh action, or of thoſe which induce a different ſtate of action. On theſe grounds the operation of thoſe remedies which are employed with greateſt ſucceſs in this affection, may, we apprehend, be explained. Fortunately it has been found, that opium is capable of giving ſome relief, if adminiſtered in proper time, and if the diſeaſe happens not to be in the moſt violent degree; the warm bath muſt alſo be brought in aid; and the patients ſhould lie horizontally in the bath, and while in it have the whole body extremely well rubbed: when taken out, they are not to be dried, but immediately put to bed wrapt in the ſofteſt blankets; and while they remain there, the belly ought either to ſtuped, or two or three bladders filled with warm water kept conſtantly lying on it. The bowels at the ſame time muſt, if poſſible, be kept open, by ſolutions of manna and *ſal polychreſt*, or ſome other purging ſalt, mixed with *oleum ricini*; or if that ſhould not be at hand, with oil of ſweet almonds and a little tincture of ſena. The opiates are to be given in large and frequently repeated doſes; ſuch as a grain of the *extractum thebaicum*, or 20 drops of the tincture, every ſecond or third hour; and it will be ſafeſt not to truſt to the thebaic tincture which is kept ready prepared in the ſhops, but order the neceſſary doſe of ſolid opium, and either give it in pills or diſſolve it in ſome convenient liquid. If ſwallowing ſhould be difficult, or the jaws cloſed up, the opium muſt be given in clyſters; for during the whole courſe of the diſeaſe it will be of ſervice to order emolient clyſters to be injected from time to time, ſince theſe will anſwer not only as a relaxing fomentation, but alſo contribute to keep the inteſtinal canal perfectly free.

When the patients recover, they continue for a long time very relaxed and weak; and no wonder, ſince it is the nature of all ſpaſmodic affections to leave behind them extreme weakneſs and relaxation of the muſcular fibres. In order to perfect the recovery, a courſe of the Peruvian bark, and the Peruvian balſam is to be tried; and the ſpine may be rubbed with ſpirituous liniments, or with a mixture of rum and Barbadoes tar: but theſe and all other ſtimulating things, either internally or externally, during the violence of the ſpaſms, muſt, in the opinion of ſome practitioners, be omitted, ſince all of them as well as bliſters have been alledged to exaſperate the diſeaſe.

This, in general, is the plan of treatment recommended by Dr Chalmers.

The ſame dreadful diſorders frequently attack young children in the warm climates. Dr Hillary tells us, that they will there ariſe from the ſame cauſes which uſually produce convulſions with children in Britain, *viz.* from a retention of the meconium or firſt excrement after birth; or from a glutinous matter which is too often found in the inteſtines of young children ſoon after the other is diſcharged; or from a cheeſy matter from the coagulation of the milk by an acid in the ſtomach; or from hard excrements; or from ſomething taken in by the mouth which is over acrid, or too hard to digeſt, which irritates their tender bowels, and ſo produces ſtartings and convulſive ſpaſms, with all the other ſymptoms which precede and accompany convulſions in young children in Britain. And this ſhows how much more readily and eaſily the nerves are affected and irritated in that warm climate, and the *tetanus* produced from a much leſs cauſe there, than it is in Britain, where it is but ſeldom ſeen. But theſe cauſes not being timely removed, their acrimony is increaſed partly by the heat of the climate, and partly by the fever which they produce, which ſtill renders them more acrid, and ſo increaſes the irritation of their bowels, that it firſt brings on ſtartings, then convulſive ſpaſms, and regular convulſion fits; which, if not ſoon removed, uſually end in a perfect *tetanus* there, and the diſeaſe is but ſeldom cured in ſuch young children when it arrives at that ſtate: for when the child lies in this miſerable, rigid, immoveable condition, upon moving its hands or feet in the moſt gentle manner, or ſoftly touching any part of its body, or giving it the leaſt motion, even feeling its pulſe in the moſt gentle tender manner, or the leaſt noiſe, or even touching its clothes, will bring on the convulſive ſpaſms, and cauſe it to be ſtrongly convulſed backwards, or drawn into a rigid ſtraight line, ſtrongly extended and immoveable like a ſtatue, and will ſo remain immoveable out of either of thoſe poſtures for a conſiderable time, a minute or two; and when the diſeaſe is arrived at this degree, Dr Hillary thinks it is never cured. But if the phyſicians be called in time, before the *tetanus* has come on (which is too ſeldom the caſe there), though he finds ſtrong convulſive ſpaſms have ſeized the child, or that it has had a convulſive fit or two, it may moſt commonly be relieved, the coming of the *tetanus* be prevented, and the life of the babe ſaved, as Dr Hillary has more than once ſeen, by removing and carrying off the irritating cauſe which ſtimulates their tender bowels, by ſuch gentle evacuations as are ſuitable to their age; and then quieting and compoſing the irritation of their nerves with proper anodynes, and correcting the remaining acrimony of the nutritious juices in the *primæ viæ*.

To anſwer theſe intentions, the following method, with variations *pro re nata et pro ratione ætatis*, as the cauſe is different, has been found to anſwer the deſired effect the beſt: R. *Seri lactis* ℥ij. *Sapon. Venet.* ℈j. *Mannæ Calab.* ʒij. *vel* iij. *Ol. amygd. dul.* ℥ſs. *Ol. fæniculi dul. gut.* ij. *Balſ Peruv. gut.* v. *Miſce, ſi. enema quam primum injiciendum.*

And if the ſymptoms of the approaching *tetanus* will permit, he gives ſomething of the following nature to aſſiſt the operation of the clyſter, and to carry off the acrimony the ſooner: R. *Aq. ſem. fæniculi* ℥iij. *Magneſ. albæ* ʒſs. *Ocul. cancr. præp.* ʒj. *Syr. e cichor. cum rheo, Roſar. ſolut. ana* ʒiij. *Miſce.* Or. R. *Aq. ſem. fæniculi* ʒiij. *Sapon. amygdal.* ʒſs. *Magneſ. albæ* ʒſs. *Syr. e cichor. cum rheo, Mannæ opt. ana* ʒij. *Ol. amygd. dul.* ʒiij. *Miſce: Exhibe cochl. parv. vel duo pro ratione ætatis omni ſemihora, vel omni hora, donec reſpond. alvus.*

Two or three ſtools being obtained by theſe, the following is exhibited in order to abate the convulſive twitchings, and prevent the *tetanus* from coming on: R. *Aq. ſem. fæniculi* ℥iij. *Magneſ. albæ* ʒſs. *Ocul. cancr. præp.* ʒj. *Moſchi orient. gr.* iij. *Spir. C. C. gut.* xv. *Syr. e mecon* ℥ſs. *Miſce: Exhibe cochl. parv.* (a child's ſpoonful) *ter quaterve de die, vel ſæpius, urgent. convulſ. vel ſpaſm.*

But if the ſymptoms ſhow that the *tetanus* is more immediately coming on, ſo that we have no time to wait till the operation of the clyſter and opening laxative be over, ſomething of the following nature muſt be immediately given; or the *tetanus* will come on, and moſt probably prove fatal to ſuch tender babes. R. *Aq. fæniculi* ʒiiij. *Moſchi orient. gr.* j. *Tinct. Thebaic. gut.* iiij. *Syr. e mecon* ʒij. *Miſce pro duobus doſ. de quibus exhibe unam quam primum, et alteram ſi convul. ſpaſm. redeunt.*

This, Dr Hillary obſerves, may be thought a bold attempt, to give *tinct. thebaica* to ſuch a tender young infant: but it is to be conſidered that the little patient will certainly die if the *tetanus* ſeize it, and that it will come on if this do not prevent it; and he has known a bold ignorant old midwife give four or five drops of that tincture to a very young infant without any prejudice more than its doſing three or four hours, though not in this caſe, but in one much leſs violent.

The clyſter may be given at the ſame time, and the opening laxative not long after it; though it may retard the operation of that for ſome time, yet it operates ſoon after, and gives relief; after which the other medicines, and fomenting the body and anointing it as before, may be uſed, if the phyſician finds it neceſſary; alſo a little of the laxative mixture may be given once or twice a-day, if the above julep does not anſwer that intention of keeping the child's body open for a few days afterwards, which in this caſe is generally found neceſſary to be obſerved.

Theſe methods and medicines may be varied according to circumſtances. For neither the ſame method nor the ſame medicines will anſwer in all caſes, though the diſeaſe be the ſame; but they muſt be changed as the cauſes differ, or the conſtitution of the ſick, or the time of the diſeaſe, or as ſome other circumſtances may require: which is a thing of great importance, not only in this, but in the cure of moſt other diſeaſes; wherefore it is mentioned here chiefly to caution the practitioners in the Weſt Indies.

When proper medicines are thus timely and judiciouſly given in this caſe, they ſeldom fail to carry off the irritating cauſe, quiet and eaſe the nerves, remove the convulſions and ſpaſms; and conſequently prevent the tetanus from coming on, and the death of the patient. But if calling in the phyſician be deferred till the tetanus has already ſtrongly ſeized the child, as is too often the caſe here, neither warm bathing, fomenting, nor any other methods or medicines whatever, will remove it or its cauſes, nor ſave the life of the little tender patient.

Dr Chalmers gives an account of his having cured one child ſeized with a *tetanus*, by purging with an infuſion of rhubarb; to which a few grains of muſk, and a little *ol. tartar. per deliq.* were added, together with the warm bath, and the frequent injection of glyſters made with an infuſion of camomile flowers, to each of which was added a ſmall portion of Caſtile ſoap. It is much to be regretted, however, that in thoſe caſes where the aſſiſtance of the medical art is moſt wanted, it moſt generally fails. We have been aſſured by a gentleman who practiſed for ſome time in the warm parts of America, that out of 30 caſes of the tetanus he had ſeen, not one of the patients recovered, though he had given opium to the quantity of 20 grains thrice a-day; and others, he was aſſured, had taken 30 grains thrice a-day. In the beginning of the diſeaſe, the medicine produced a violent headach; but towards the end, it had no manner of effect whatever. In two patients, the diſeaſe came on from the ſlighteſt cauſes imaginable. The one accidentally fell in attempting to avoid a loaded cart, and put the heel of his ſhoe upon one of his thumbs in riſing; the other, in avoiding the ſame cart, ſlightly ruffled the ſkin of his noſe. Both were ſeized with the tetanus; and both died, notwithſtanding all poſſible aſſiſtance was given. The former had his thumb amputated without effect.

In the Edinburgh Phyſical and Literary Eſſays, Vol. III. Dr Donald Monro deſcribes a new method of cure, communicated to him by a gentleman who was formerly a practitioner in Jamaica. While this gentleman practiſed in that iſland, he had under his care a great number of caſes of tetanus attended with the locked-jaw. At firſt, he uſed to give very freely of opium, muſk, and other medicines of this claſs; to bleed, and make other evacuations; while he uſed baths, fomentations, embrocations, and other external applications, but all without the leaſt ſucceſs; and, as he had loſt a great many patients without being ſo lucky as to make one cure, he began to believe that this diſorder always proved fatal, and was not to be cured by medicine, notwithſtanding what ſome practioners had alledged. However, having received an unexpected hint concerning the good effects of the mercurial ointment in ſuch caſes, he reſolved to try it; and ordered the firſt patient that offered to be put into a warm room, and to be rubbed two or three times a-day with the ointment, till ſuch time as a ſalivation was raiſed; when he with pleaſure obſerved, that as ſoon as the mercury began to affect the mouth, the convulſions of the muſcles of the jaws, as well as all the other ſpaſms and convulſions, ceaſed, and the patient was freed of all his complaints. After this, he treated every caſe of this kind which came under his care in the ſame manner, and cured twelve, which were all who applied to him for advice ſo early in the diſorder that there was time to bring the mercury to the mouth before the fatal period was expected. A few died, in whom the diſeaſe was ſo far advanced before he ſaw them that there was not time to raiſe a ſalivation. None of the caſes which were under this gentleman's care in the Weſt Indies were the conſequences of wounds or capital operations; nor has he had any opportunity of trying it ſince in caſes of the locked jaw, which ſometimes follows capital operations, owing to his having given over practice: but he thinks, that, from the ſimilarity of the complaint, there is no doubt that the mercurial frictions would be equally efficacious in ſuch caſes, as when the diſorder comes from catching cold or other ſuch cauſes.

In the ſecond volume of the Medical Tranſactions, we have an account of a cure performed by Dr William Carter of Canterbury, by means very different from any of thoſe above related.—On the 17th of May 1767, the doctor was called to a ſtrong healthy man, in the 21ſt year of his age, and who had been confined to his bed for three weeks. What gave riſe to his preſent diſorder was a wound on the inner ankle of his right leg, which he had received ſix weeks before from a joiner's chiſel. At that time his mouth was ſo far cloſed, as to admit only the moſt liquid nouriſhment, which he conſtantly ſucked through his teeth: but his legs and jaw, and the whole length of the ſpina dorſi, were quite immoveable, being as ſtiff and rigid as thoſe of a perſon long dead; his head was drawn backward, and he was frequently ſtrongly convulſed. The motion indeed of both his arms was but a little impaired. From the beginning to the end, his ſight, hearing, and memory, continued perfect; his appetite was good; and his ſenſes, in the day-time, entire, though ſometimes wandering in the night. As to his pulſe, that was regular; if it deviated at all from the pulſe of a perſon in health, it was rather ſlow than quick, and ſomewhat fuller than natural. Such was the ſituation of his patient; a detail of which had been given before the doctor ſet out on his journey, which he undertook with a determined reſolution to make uſe of the method recommended by Dr Silveſter, in the firſt vol. of Medical Obſervations and Inquiries, publiſhed in the year 1757, (and which has been related from Dr Chalmers and Dr Hillary.) But, on his arrival at the houſe, he found great quantities of the *extractum thebaicum* diſſolved

Spaſmi

had been already given him; and that, for the five laſt days, he had taken no leſs than 28 grains of that medicine, with 50 grains of muſk, in the ſpace of 24 hours, without any ſenſible effect, except the bringing on a confuſed ſleep, out of which he frequently awoke in great hurries, attended with a violent pain in the head, which almoſt deprived him of his ſenſes. The doctor was afraid to extend the doſe; and ſoon determined to take ſome other method, though at a loſs what method to purſue, as, during a courſe of almoſt 30 years practice, nothing of the ſame kind had ever fallen under his cognizance before. Reflecting, however, that this diſorder had always been deemed of the ſpaſmodic kind, and that the good effects produced by the *extractum thebaicum* muſt probably be owing to the relaxing and reſolving faculty of that medicine, he directed a bliſter to be applied between the ſhoulders, the whole length of the ſpine; the jaw to be anointed with the *oleum lateritium*; and a purge conſiſting of the *tinctura ſacra*, *tinctura jalappi*, and the *ſyrupus de rhamno cathartico*, to be given him. This was repeated three ſeveral times afterwards, at the diſtance of three or four days between each doſe. On the intermediate days, he was ordered the *oleum ſuccini*, the fœtid gum, and the *oleum amygdalinum*. Of the firſt he took 30 drops, of the gum 20 grains, and of the laſt four ounces, in 24 hours. By theſe means, and theſe only, the convulſions ſoon ceaſed; and he grew daily better and better, till at the end of a fortnight he was able to walk about his room, and in leſs than three weeks became in all reſpects well, ſome ſmall weakneſs in the parts only excepted. The jaw was relieved firſt, after that the ſpine, and laſt of all the legs. A pain and uneaſineſs in the places affected, neither of which he had felt before, were the forerunners of his approaching amendment.

From all this it ſeems reaſonable to conclude, either that there is no certain remedy for tetanus in all caſes, or that the medicines which prove effectual in one conſtitution will fail in another. Thus, it is poſſible, that in caſes where opium proves ineffectual, mercury may be a remedy; and on the contrary, where mercury fails, opium may be effectual; and even where both are ineffectual, the antiſpaſmodics recommended by Dr Carter may be of uſe. It is therefore neceſſary for phyſicians to be extremely careful to obſerve the effects of the firſt doſes of their remedies: for if the ſymptoms ſhow not the leaſt appearance of remiſſion after a large doſe of opium, it is improbable that it can be cured by a repetition of the medicine; and as no time can be loſt with ſafety, it will then be proper to apply mercurial ointment, or whatever elſe may be judged proper.—In the Edinburgh Medical Commentaries we have an account of the cold bath being uſed as a remedy, by Dr Thomas Cochrane, at that time phyſician at Nevis, now at Edinburgh. The patient was an Eaſt Indian boy, who had been gored by a cow, and afterwards expoſed to a rainy damp air for ſome hours. Dr Cochrane aſcribes his cure to the cold bath, which was applied by daſhing the water upon his body. But as the patient at the ſame time got laudanum, at firſt in the quantity of 200 drops a-day, and afterwards in ſtill larger doſes; and had beſides his throat and ſhoulders anointed with warm oil of turpentine, was bled, and had lenient glyſters and laxatives; it is by no means eaſy to ſay what ſhare the cold bath had in his cure. Dr Cochrane, however, ſays he has heard of ſome caſes being treated ſucceſsfully by cold water and the Peruvian bark in St Euſtatia and St Kitt's, and in another letter mentions his having uſed the cold bath in other caſes of tetanus with ſucceſs. But ſince Dr Cochrane's publication, a more full and ſatisfactory account of the benefit of this practice has been communicated in a paper publiſhed by Dr Wright, in the ſixth volume of the London Medical Obſervations. Dr Wright gives a particular account of ſix caſes, in which the beſt effects were obtained from daſhing cold water upon the patient; and he obſerves, that ſince he firſt uſed this method of cure he never failed in one inſtance to effect a recovery, and that in a ſhorter time than by any other method hitherto propoſed. This practice has on ſome occaſions been adopted by practitioners in Britain, although here the diſeaſe is a much leſs frequent occurrence. It has particularly been employed with ſucceſs by Dr Currie of Liverpool; and we hope that ſtill more extenſive practice will confirm the benefit to be derived from it, although not in every inſtance, yet in many caſes of this affection.

Tetanus.

Very lately a different mode of cure in this affection has been recommended by Dr Ruſh, profeſſor of medicine in Philadelphia, in a paper intitled Obſervations on the Cauſe and Cure of Tetanus, publiſhed in the ſecond volume of the Tranſactions of the American Philoſophical Society. Dr Ruſh, viewing tetanus as being a diſeaſe occaſioned by relaxation, thinks the medicines indicated to cure it are ſuch only as are calculated to remove this relaxation, and to reſtore tone to the ſyſtem. On this ground he recommends the liberal uſe of wine and the Peruvian bark; and tells us, that he has employed them with ſucceſs in actual practice. When the diſeaſe ariſes from a wound of any particular place, he recommends ſtimulants to the part affected; ſuch as dilatation of the wound, and filling it with oil of turpentine. How far this practice will be confirmed by more extenſive experience, we cannot take upon us to determine. We may only obſerve, that a very contrary practice has been recommended as highly ſucceſsful by ſome practitioners in Spain, where tetanic affections are a very frequent occurrence in conſequence of ſlight accidents. There gentle emollients are ſtrongly recommended, particularly immerſing the wounded part in tepid oil for the ſpace of an hour or ſo at a time, and repeating this application at ſhort intervals. By this mode many caſes, after very alarming appearances had taken place, are ſaid to have been completely and ſpeedily removed. While the practice is very ſimple, it appears at the ſame time in many reſpects very rational, and may perhaps be conſidered as well deſerving a trial in the firſt inſtance.

GENUS XLIX. TRISMUS. 280

The LOCKED JAW.

Triſmus, *Sauv.* gen. 117. *Lin.* 124. *Sag.* gen. 223.
Capiſtrum, *Vog.* 208.

Sp. I. TRISMUS NASCENTIUM. 281

Locked Jaw in children under two months old.

Triſmus naſcentium, *Sauv.* ſp. 1. *Heiſter.* Comp. Med. Pract. cap. xv. § 10. *Cleghorn* on the Diſeaſes of Minorca, Introd. p. 33. *Hofer* in Act. Helvet. tom. i. p. 65.

This diſtemper is ſo cloſely connected with the tetanus, that it ought rather to be accounted a ſymptom of the tetanus than a primary diſeaſe. We have accordingly diſcuſſed it under Tetanus.

282 Sp. II. The Trismus from *Wounds or Cold.*

Triſmus traumaticus, *Sauv.* ſp. 2. *Lond. Med. Obſ.* Vol. I. art. 1. 7. Vol. II. 34. Vol. III. 31. Vol. IV. 7.
Angina ſpaſmodica, *Sauv.* ſp. 18. *Zwingeri* Act. Helvet. Tom III. p. 319.
Convulſio a nervi punctura, *Sauv.* ſp. 2.
Triſmus catarrhalis, *Sauv.* ſp. 15. *Hillary*'s Barbadoes, 221. *Lond. Med. Obſ.* Vol. IV. 7.

The internal remedies proper in all caſes of the locked jaw, from whatever cauſe it may proceed, have been already mentioned under Tetanus: the external treatment of wounded parts which may give occaſion to it belongs to the article Surgery. But of this alſo we have offered ſome obſervations under the head of Tetanus; and, indeed, Triſmus may be conſidered as being merely an incipient tetanus, or rather a ſlight degree of that diſeaſe.

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Genus L. CONVULSIO.
Convulsions.

Convulſio, *Sauv.* gen. 128. *Lin.* 142. *Vog.* 191. *Sag.* gen. 235.
Convulſio univerſalis, *uauv.* ſp. 11.
Hieranoſos, *Lin.* 144. *Vog.* 190.
Convulſio habitualis, *Sauv.* ſp. 12.
Convulſio intermittens, *Sauv.* ſp. 16.
Convulſio hemitotonos, *Sauv.* ſp. 15.
Convulſio abdominis, *Sauv.* ſp. 10.
Convulvſio ab inanitione, *Sauv.* ſp. 1.
Convulſio ab onaniſmo, *Sauv.* ſp. 13.
Scelotyrbe feſtinans, *Sauv.* ſp. 2.

Deſcription. When convulſions attack only particular parts of the body; they are generally attended with ſome kind of paralyſis at the ſame time, by which means the affected parts are alternately convulſed and relaxed; a permanent convulſion, or unnatural contraction of particular muſcles, is called a *ſpaſm* or *cramp.* Theſe partial convulſions may attack almoſt any part of the body; and are not unfrequently ſymptomatic, in fevers, the cholera morbus, &c. The involuntary ſtartings of the tendons, the picking of the bed-clothes, &c. in acute diſeaſes, &c. are all of them convulſive diſorders. Convulſions, even when moſt generally extended, differ from epilepſy in not being attended with any mental affection or abolition of ſenſe, and not followed by the ſame torpid ſtate.

Cauſes. Convulſions, not only of particular parts, but alſo over the whole body, often take place from cauſes not very evident. Sometimes they ſeem to depend on a certain delicacy or irritability of the nervous ſyſtem, which is framed with ſuch exquiſite ſenſibility as to be ſtrongly affected by the ſlighteſt cauſes. Delicate women are often ſubject to hyſterical convulſions, and alſo hypochondriac people. Convulſions, however, often take their riſe from wounds, irritations of the ſtomach and inteſtines by worms, poiſons, violent cathartics and emetics, &c.; and very often they are ſymptomatic, as in dentition, the ſmall-pox, and many kinds of fevers.

Prognoſis. Except in ſome few caſes, convulſive diſorders are always to be dreaded; but leſs in young people than in ſuch as are advanced in life. Thoſe which attack girls under the age of puberty, will generally ceaſe on the appearance of the menſes; and boys have likewiſe a chance of being relieved as they advance in life: but in grown up people, unleſs the cauſe be very evident, a cure is hardly to be expected, eſpecially after the diſeaſe has been of long continuance.

Cure. The treatment is very much the ſame with that of epilepſy, afterwards to be conſidered: but a recovery is moſt frequently obtained by the removal of the exiſting cauſe.

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Genus LI. CHOREA.
St Vitus's Dance.

Scelotyrbe, *Sauv.* gen. 136. *Sag.* 243.
Chorea, *Lin.* 139.
Scelotyrbe chorea Viti, *Sauv.* ſp. 1.
Chorea St Viti, *Sydenh.* Sched. Monit.

Deſcription. This diſeaſe ſhows itſelf firſt by a kind of lameneſs or inſtability of one of the legs, which the patients draw after them in a ridiculous manner: nor can they hold the arm of the ſame ſide ſtill for a moment; for if they lay it on their breaſt, or any other part of their body, it is immediately forced away by a convulſive motion. If they be deſirous of drinking, they uſe a number of odd geſticulations before they can bring the cup to their mouths, becauſe their arms are drawn this way and that by the convulſions which affect them.

Cauſes, &c The general cauſe of St Vitus's dance is a debility of the ſyſtem; and hence we find it attacks only weakly boys, and more eſpecially girls, when under the age of puberty. But the particular cauſes determining the muſcles to be affected in ſuch and ſuch a manner are entirely unknown.

Prognoſis. As this diſorder ſcarce ever attacks any perſons but ſuch as are under the age of puberty, there is almoſt a certain proſpect of its being then cured, though generally the diſorder is eaſily removed before that time.

Cure. See Epilepsy.

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Genus LII. RAPHANIA.

Raphania, *Lin.* 155. *Vog.* 143. *Lin.* Amœn. Acad. Vol. VI.
Convulſio raphania, *Sauv.* ſp. 7.
Eclampſia typhodes, *Sauv.* ſp. 1. *Seunert* de febr. l. iv. cap. 16. *Gregor. Horſt.* Oper. tom. II. l. viii. obſ. 22. *Brunner* in Ephem. Germ. D. ii. A. ii. obſ. 224. *Williſch.* ibid. cent. vii. obſ. 13. *Wepfer.* de Affect Capitis, obſ. 120. *Breſlauer* Sammlung 1717, Julio Septembri & Decembr. Ibid. 1723, Januar. A. N. C. Vol. VII. obſ. 41. *Bruckmann* Com. Norimb. 1743, p. 50.

Deſcription. According to Sauvages, this diſtemper begins with a laſſitude of the limbs, tranſient colds and ſhiverings, pain of the head, and anxieties of the præcordia. Then come on ſpaſmodic ſtartings of the fingers and feet; alſo of the tendons and muſcles, conſpicuous below the ſkin. The diſeaſe is attended with heat, fever, delirium, ſtupor, conſtriction of the breaſt, ſuffocating dyſpnœa, loſs of voice, horrid convulſions of the limbs, preceded by a formication, or ſenſation as of ants or other ſmall inſects creeping on the parts. In this ſtate of the diſeaſe, the convulſive paroxyſms are attended with moſt violent pains in the limbs, vomiting, or diarrhœa, with the paſſing of worms, thirſt, and in young people an unnatural hunger. It continues from ten days to three months. About the eleventh or twentieth day, ſome are relieved by copious ſweats, or purple exanthemata: while others fall into a tabes, with ſtupor, or ſtiffneſs of the joints.

Cauſes, &c. This diſeaſe is frequently epidemic in Suabia and other parts of Germany; where it is ſaid to be produced by ſeeds of radiſhes, which are often mixed with rye in that country; and from this ſuppoſed cauſe the diſeaſe takes its name. It is alſo, however, a very common opinion, that this diſeaſe depends on the rye uſed in diet being of a bad quality, and particularly containing a large proportion of what is called *ſpurred rye*.

Cure. In this affection, alſo, the cure, as far as it has yet been diſcovered, is very much the ſame with that of epilepſy, the diſeaſe next to be conſidered.

286 GENUS LIII. EPILEPSIA.

FALLING-SICKNESS.

Epilepſia, *Sauv.* gen. 134. *Lin.* 143. *Vog.* 188. *Sag.* gen. 24. *Boerh.* 1071. *Hoffm.* III. 9. *Junck.* 54.
Eclampſia, *Sauv.* gen. 133. 180. *Sag.* gen. 240.

287 Sp. I. The CEREBRALIS, or *Epilepſy* depending on an affection of the *Brain.*

Epilepſia plethorica, *Sauv.* ſp. 1.
Eclampſia plethorica, *Sauv.* ſp. 7.
Epilepſia cachectica, *Sauv.* ſp. 2.

288 Sp. I. The SYMPATHICA, or *Sympathetic Epilepſy*, with a ſenſation of ſomething riſing from a certain part of the body towards the Head.

Epilepſia ſympathica, *Sauv.* ſp. 8.
Epilepſia pediſymptomatica, *Sauv.* ſp. 6.

289 Sp. II. The OCCASIONALIS, or *Epilepſy* ariſing from various irritating Cauſes.

Epilepſia traumatica, *Sauv.* ſp. 13.
Eclampſia traumatica, *Sauv.* ſp. 9.
Epilepſia a dolore, *Sauv.* ſp. 10.
Epilepſia rachialgica, *Sauv.* ſp. 14.
Eclampſia a doloribus, *Sauv.* ſp. 4.
  a. Rachialgica.
  b. Ab otalgia.
  c. A dentitione.
Eclampſia parturientiem, *Sauv.* ſp. 3.
Eclampſia verminoſa, *Sauv.* ſp. 2.
Eclampſia ab atropa, *Sauv.* ſp. 11.
Eclampſia ab œnanthe, *Sauv.* ſp. 12.
Eclampſia a cicuta, *Sauv.* ſp. 13.
Eclampſia a coriaria, *Sauv.* ſp. 14.
Epilepſia exanthematica, *Sauv.* ſp. 11.
Epilepſia cachectica, *Sauv.* ſp. 2.
Epilepſia ſtomachica, *Sauv.* ſp. 3.
Eclampſia a ſaburra, *Sauv.* ſp. 5.
Epilepſia a pathemate, *Sauv.* ſp. 7.
Eclampſia ab inanitione, *Sauv.* ſp. 8.
Epliepſia neophytorum, *Sauv.* ſp. 15.

Deſcription. The epilepſy often attacks ſuddenly and without giving any warning: but more frequently is preceeded by a pain in the head, laſſitude, ſome diſturbance of the ſenſes, unquiet ſleep, unuſual dread, dimneſs of ſight, a noiſe in the ears, palpitation of the heart, coldneſs of the joints, and in ſome there is a ſenſation of formication, or a cold-air, &c. aſcending from the lower extremities towards the head. In the fit, the perſons fall ſuddenly to the ground (whence the name of the *falling-ſickneſs*), frequently with a violent cry. The thumbs are ſhut up cloſe in the palms of the hands, and are with difficulty taken out; the eyes are diſtorted, ſo that nothing but the whites are to be ſeen; all ſenſation is ſuſpended, inſomuch, that by no ſmell, noiſe, or otherwiſe, nor even by pinching the body, can they be brought to themſelves; they froth at the mouth, with a hiſſing kind of noiſe; the tongue is frequently lacerated by the teeth, and there is a violent convulſive motion of the arms and legs. Sometimes, however, the limbs, inſtead of being agitated by convulſive motions, are all ſtiff, and the patients are as immoveable as a ſtatue. In children the penis is erected; and in young men there is an emiſſion of the ſemen, and the urine is often thrown out to a conſiderable diſtance. At length there is a remiſſion of the ſymptoms, and the patients recover after a longer or ſhorter interval; when they complain of a pain, torpor, or heavineſs of the head, with a laſſitude of all the joints.

Cauſes, &c. The diſſection of epileptic ſubjects has ſhown a variety of morbid appearances, which may be ſuppoſed to have contributed to the diſeaſe; ſuch as indurations in the brain or meninges; carries of the internal ſurface of the cranium; projections of the boney ſubſtance of the ſame, preſſing upon the brain; collections of ſerum or purulent matter, and earthy concretions within the ſkull; beſides many others which are recorded by Bonetus, Morgagni, and Lieutaud. But often the cauſes are impoſſible to be diſcovered; for even in thoſe who have died of the diſeaſe, the brain and all other parts of the nervous ſyſtem have been apparently ſound. The diſeaſe will attack ſtrong as well as weak people; and in thoſe who are ſubject to it, any conſiderable exceſs in drinking, a ſurfeit, violent paſſion, or venery, &c. will certainly being on a fit. Some have epileptic paroxyſms returning periodically after conſiderable intervals; and the diſeaſe has been thought to have ſome dependence on the phaſes of the moon.

Prognoſis. If the epilepſy comes on before the time of puberty, there are ſome hopes of its going off at that time. But it is a bad ſign when it attacks about the 21ſt year, and ſtill worſe if the fits grow more frequent; for then the animal-functions are often deſtroyed, as well as thoſe of the mind, and the patient becomes ſtupid and fooliſh. Sometimes it will terminate in melancholy or madneſs, and ſometimes in a mortal apoplexy or palſy. It has ſometimes however, been obſerved, that epilepſies have been removed by the appearance of cutaneous diſeaſes, as the itch, ſmall-pox meaſles, &c. While the diſeaſe is recent, therefore, we are not to deſpair of a cure; but if it be of long ſtanding, or hereditary, there is very lttle reaſon to be expect that it can be removed.

Cure. From the ſymptoms occurring in epilepſy, which conſiſt of involuntary convulſive motions, and an affection of the mental powers, there is reaſon to conclude, that the fit immediately depends on the induction of ſome peculiar action of the brain; but that convulſions may enſue from this cauſe, it would ſeem neceſſary that there ſhould alſo occur a peculiar diſpoſition to action in the moving fibres. On this ground then, we may ſuppoſe the cure to be chiefly expected on one of two principles; either by our being able to prevent the peculiar action of the brain, or to remove the diſpoſition to action in the moving fibres. The firſt is chiefly to be acompliſhed by the removal of irritating cauſes, by preventing their influence from being propagated to the brain, when they are applied to remote parts; or by counteracting their influence, from inducing in the brain a ſtate of action different from that to which they give riſe. The ſecond end is chiefly to be obtained by diminiſhing the mobility of the nervous energy, and by ſtrengthening the tone of the moving fibres. It muſt, however, be allowed, that in all convulſive diſorders, excepting thoſe which are cured by nature about the time of puberty, the cure by artificial means is very difficult. Numberleſs ſpecifics have been recommended, but all of them have failed of anſwering the expectation. When the cauſe can be diſcovered, that muſt be removed. In other caſes, the cold bath, valerian root, caſtor, muſk, opium, the fœtid gums, Peruvian bark, with the whole tribe of nervous and antiſpaſmodic medicines, have been recommended: but none of theſe, or indeed any combination of them, have been found generally uſeful; though the ſlighter, or ſymptomatic caſes, may often be removed by them.

Of late the *calx*, improperly called the *flowers*, of zinc, have obtained ſuch reputation in convulſive diſorders as to be received into the Edinburgh Pharmacopœia under the title of *zincum uſtum*. They were propoſed by Dr Gaubius as an antiſpaſmodic, in his *Adverſaria;* and their efficacy has ſince been confirmed by various obſervations. In an inaugural diſſertation publiſhed by Dr Hart at Leyden, the medical virtues of the flowers of zinc are conſidered. He obſerves, that they have long been uſed externally, chiefly for inflammations of the eyes from acrid lymph. Glauber firſt propoſed the internal uſe of them; and Gaubius diſcovered them to be the remedy of a celebrated empiric Luddemannus, which he ſtyled his *luna fixata*. After this he exhibited them with ſucceſs in convulſive and ſpaſmodic diſeaſes. Dr Hart ſuppoſes, that they act either as abſorbents, or as poſſeſſing a ſpecific virtue: but is a ſtrong advocate for their efficacy, on whatever principles they may operate; and, in favour of his opinion, relates ſeven caſes in which they proved ſucceſsful. A girl of 17 years of age, was ſeized with a ſlight *chorea* from a fright; and when the diſeaſe had continued ſix days, ſhe began to take the flowers of zinc, by which her diſorder was removed in leſs than three weeks. Her cure required only 16 grains of the calx. In a few months the complaints returned, from the ſame cauſe; and were removed by four grains of the medicine divided into ten doſes.—A boy of about four years old, labouring under a real epilepſy, ſuſpected to be hereditary, was cured by a grain of the flowers of zinc taken every day for ſome time.—A man 50 years old, thrown into convulſions from a violent paſſion, was cured by a grain of the calx taken every two hours. The diſeaſe had gone off upon veneſection and the uſe of ſome other remedies; but returned again in two weeks, when it was finally removed by the zinc. The two laſt caſes are related from Dr Gaubius, who affirms that he has uſed the flowers of zinc in caſes of the chincough, hyſteric hiccough, and ſpaſmus cynicus; that they frequently did more than other medicines, but were by no means ſucceſsful in every caſe. The other cures mentioned by Dr Hart are ſimilar to thoſe abovementioned. But it does not appear that he ever ſaw a confirmed epilepſy cured by this medicine.

In the firſt volume of *Edinburgh Medical Commentaries*, we have an account by Mr Benjamin Bell, of a man afflicted with a confirmed epilepſy, who was conſiderably relieved by the flowers of zinc. He was about 35 years of age, and had been ſubject to the diſeaſe for 10 yeaſs. At firſt the paroxyſms did not return oftener than once a month; but becoming gradually more frequent, they came at laſt to be in a manner continual, inſomuch that he would have ten, eleven, or twelve attacks in a day, and very ſeldom had an interval of 24 hours. His memory and judgment were ſo much impaired, that he could ſcarce anſwer a queſtion diſtinctly. He had uſed a great variety of medicines without any benefit. About three years before applying to Mr Bell, he had violent rheumatic pains in his limbs, which left ſuch an extreme debility that he was never afterwards able to get out of bed without the aſſiſtance of two or three people.

On the 22d of October 1772, Mr Bell found him in the abovementioned condition, and preſcribed as follows:

R. *Flor. Zinc.* gr. xxiv.
Ext. Gent. ʒi. M. f. maſſ. et divid. in pill. xxiv. cap. i. m. & v.

He continued to take two pills a-day till the firſt of November, without any ſenſible benefit. The doſe was then doubled, and continued till the 12th; when the fits, though equally violent, became leſs frequent. The medicine was gradually augmented to ten pills thrice a-day; and the conſequence was, that his memory and underſtanding returned, the fits became much ſlighter and leſs frequently repeated, though the diſeaſe could not be radically ſubdued.

In a young man labouring under the epilepſy, in whom the fits were preceded by an *aura epileptica*, or ſenſation like air ariſing from the inſide of the knee-joint, the diſeaſe was alſo relieved, but not cured.

Dr Percival relates ſome caſes of epilepſy which ſeem to have been cured by the flowers of zinc; and in other caſes, where the diſeaſe was not entirely removed by it, the ſpaſms were nevertheleſs much mitigated. He did not obſerve that it promoted any evacuation; excepting that in ſome, upon being firſt taken, it occaſioned a little ſickneſs, which went off with a ſtool. He adds, that thoſe apothecaries who do not prepare this medicine themſelves, are in great danger of being impoſed upon, as it is ſometimes a mere corroſion of the zinc by an acid, and even imperfectly waſhed.

The good effects of calcined zinc as an antiſpaſmodic are alſo atteſted by Dr Haygarth of Cheſter and Dr White of York. The former gives a teſt of their goodneſs which may be of uſe to thoſe who do not prepare them, namely, that the true flowers of zinc, when ſtrongly heated, become yellow, but reaſſume their white colour on being allowed to cool. The latter gives a caſe of heiranoſos, or ſtrange convulſions of almoſt all the muſcles of the body, cured by zinc, after a number of other remedies had failed. The patient, however, had been formerly much relieved by Ward's antimonial pill.

In Dr Home's clinical experiments and hiſtories, alſo calcined zinc is mentioned as having been found ſerviceable upon trial in the Royal Infirmary of Edinburgh. Of the other principal remedies which have been recommended for the epilepſy and other convulſive diſorders allied to it, we have the following account by the ſame author.

1. *The cold-bath* was tried in one who had a convulſive diſorder of one ſide, but the ſymptoms were rendered much worſe by it,

2. *Veneſection.* Not to be depended on in convulſions.

3. *Electricity.* In two convulſive caſes was of no ſervice.

4. *Epiſpaſtics.* Do not ſeeem to be powerful antiſpaſmodics.

5. *Valerian.* In nine convulſive caſes, for which this remedy hath been reckoned almoſt a ſpecific, it not only made no cure, but could ſcarcely be reckoned to do any good. Dr Home ſuppoſes that it acts as a bitter tonic, ſomething like the *ſerpentaria Virginiana.* Though much uſed at preſent, he tells us it has always appeared to him a weak, often a hurtful, medicine.

6. *Muſk.* Six convulſive patients treated with large doſes of this remedy, were neither cured nor in the leaſt relieved.

7. *Caſtor* ſeems to be unworthy of the confidence formerly put in it. It is indeed poſſeſſed of a ſedative power, and therefore may be uſeful in ſpaſmodic feveriſh caſes.

8. *Aſafœtida* has conſiderable antiſpaſmodic powers, but is not always ſucceſsful. It heats and quickens the pulſe; and is therefore improper in caſes attended with inflammation. It diſagrees with ſome from a peculiarity of conſtitution; exciting pain in the ſtomach, and vomiting; but this can be known only after the exhibition of the medicine.

9. *Cortex Peruvianus.* Of ſeven ſpaſmodic caſes, ſix were either cured or mitigated. An epilepſy of eight years ſtanding was very much relieved by taking the bark for a month, and one of two years ſtanding by taking it for ten days. But the medicine is of a heating nature, and therefore is not to be employed in caſes attended with inflammatory ſymptoms.

10. *Peony root* was given two epileptic patients without the leaſt ſucceſs.

11. *Viſcus quercinus*, or miſletoe, was given in the quantity of two ſcruples five times a-day to an epileptic patient, without ſucceſs.

12. *Extractum hyoſciami* was given to an epileptic patient, to one afflicted with the hemitotenos, and to one who laboured under the hyſteric affection, without the leaſt good effect.

13. *Folia aurantiorum* were exhibited with the like bad ſucceſs. Five drachms of the powdered leaves were taken at once without any ſenſible effect.

14. *Cardamine pratenſis*, in three epileptic caſes, was not attended with any ſucceſs.

15. *Opium* did no good.

16. *Cuprum ammoniacale* made no cure in four caſes of epilepſy in which it was tried.

That in many caſes all theſe remedies have been employed without ſucceſs, is not to be denied: and indeed it may with confidence be aſſerted, that a great majority of caſes of epilepſy are incurable by any remedy that has yet been diſcovered. At the ſame time, as there is incontrovertible evidence that ſome of them have ſucceeded at leaſt in certain caſes, the more powerful may always be conſidered as deſerving a fair trial. The cuprum ammoniacum, in particular, ſeems well intitled to the attention of practitioners; for though it be a medicine of great activity, yet under prudent adminiſtration it may be employed even with very young ſubjects without any hazard; and in ſeveral inveterate caſes, which had obſtinately reſiſted other medicines, it has brought about a complete recovery.

GENUS LIV. PALPITATIO. 290

PALPITATION *of the* HEART.

Palpatio, *Sauv.* gen. 130. *Lin.* 132 *Vog.* 213.
Sag. 237. *Hoffm.* III. 83. *Junck.* 33.

THE palpitation of the heart is ſometimes ſo violent, that it may be heard at a conſiderable diſtance. It may proceed from a bad confomation of the heart itſelf, or ſome of the large veſſels. It may alſo be occaſioned by wounds or abſceſſes in the heart; or it may proceed from polypous concretions or oſſifications of that viſcus, or from plethora, fear, or ſpaſmodic affections of the nervous ſyſtem. When it proceeds from diſeaſes of the heart or large veſſels, it is abſolutely incurable. In ſpaſmodic caſes, the remedies above related may be uſed. If the patient be plethoric, bleeding will probably remove the diſorder, at leaſt for the preſent.

GENUS LV. ASTHMA 291

Aſthma, *Sauv.* gen. 145. *Lin.* 161. *Vog.* 268. *Sag.* gen. 282.
Aſthma convulſivum, et ſpaſmodico-flatulentum, *Hoffm.* III. 94.
Aſthma ſpaſticum, *Junck.* tab. 51.

Sp. I. *Spontaneous* ASTHMA.

Aſthma humidum, *Sauv.* ſp. 1. Flatulentum, *Floyer* on the Aſthma, chap. i.
Aſthma convulſivum, *Sauv.* ſp. 2. *Willis* Pharm. rat. P. II. ſect. i. cap. 12.
Aſthma hyſtericum, *Sauv.* ſp. 3. *Floyer* on the Aſthma, chap. i.
Aſthma ſtomachicum, *Sauv.* ſp. 8. *Floyer*, Scheme of the ſpecies of Aſthma. Periodic Aſthma 6.
Orthopnœa ſpaſmodica, *Sauv.* ſp. 3.
Orthopnœa hyſterica, *Sauv.* ſp. 4.

Sp. II. The *Exanthematic* ASTHMA.

Aſthma exanthematicum, *Sauv.* ſp. 11.
Aſthma cachecticum, *Sauv.* ſp. 13.

The

Sp. III. The *Plethoric* Asthma.

Aſthma plethoricum. *Sauv.* ſp. 15.

The aſthma is a chronic diſeaſe, which may continue to give very great diſtreſs, at intervals, for a conſiderable number of years. Sir John Floyer, when he wrote his celebrated treatiſe, had laboured under repeated paroxyſms for 30 years.

The common diſtinction is into *humid* and *dry*; the former is accompanied with an expectoration of mucus or purulent matter, but the latter is not. In the genuine humoral aſthma, the patients are obliged to lean forward; the inſpiration is ſhort and ſpaſmodic; and the expiration very ſlow.

Aſthmatic perſons have generally ſome warning of the attack, from a languor, loſs of appetite, oppreſſion, and ſwelling of the ſtomach from flatulence, which precede the fit; but it is uſually in the middle of the night that the violent difficulty of breathing comes on.

The duration of the paroxyſm is uncertain, as it will ſometimes terminate in three or four hours, while at other times it ſhall continue for as many days; nay, it has been known to laſt three weeks without intermiſſion. While it ſubſiſts, the patient is in very great diſtreſs, not being able to lie in bed, nor ſcarcely to ſpeak or expectorate, ſo great is the difficulty of breathing; and yet, notwithſtanding all this apparent interruption to the free paſſage of the blood through the lungs, an inflammation here ſeldom or never ſupervenes a fit of the aſthma. As the paroxyſm wears off, and the breathing becomes free, there is more or leſs of an expectoration of mucus; and the urine, from being pale and limpid becomes high-coloured, and lets fall a copious ſediment.

In order to obtain relief in the fit, we muſt ſometimes bleed, unleſs extreme weakneſs or old age ſhould forbid, and repeat it according to the degrees of ſtrength and fullneſs: a purging clyſter, with a ſolution of aſafœtida, muſt be immediately injected; and if the violence of the ſymptoms ſhould not ſpeedily abate, it will be proper to apply a bliſtering plaſter to the neck or breaſt.

In the height of the paroxyſm, an emetic might be followed by dangerous ſymptoms, as it would increaſe the accumulation of blood in the veſſels of the head; but vomiting will often prevent a fit of the aſthma, eſpecially if the ſtomach ſhould chance to be loaded with any ſort of ſaburra. A very ſtrong infuſion of roaſted coffee has been found to give eaſe in an aſthmatic paroxyſm.

Sir John Pringle ſays it is the beſt abater of the paroxyſms of the periodic aſthma that he has ſeen. The coffee ought to be of the beſt Mocco, newly burnt, and made very ſtrong immediately after grinding it. He commonly ordered an ounce for one diſh; which is to be repeated freſh after the interval of a quarter or half an hour; and which is to be taken without milk or ſugar. The medicine in general is mentioned by Muſgrave in his treatiſe *de Arthritide anomala*; but he firſt heard of it from a phyſician in Litchfield, who had been informed by the old people of that place, that Sir John Floyer, during the latter part of his life, kept free from, or at leaſt livid eaſy under, his aſthma, from the uſe of very ſtrong coffee. This diſcovery, it ſeems, he made after the publication of his book upon that diſeaſe. Dr Percival ſays he has frequently directed coffee in the aſthma with great ſucceſs.

In the intervals of the fits, perſons ſubject to the aſthma, eſpecially the humid ſpecies, ſhould take emetics from time to time. An infuſion of tobacco is an emetic that has been ſaid to be very ſerviceable in ſome aſthmatic caſes; but its operation is both ſo diſtreſſing and ſo dangerous, that it will never probably be introduced into common uſe as an emetic; and ſmoking or chewing the ſame has been known to prevent the frequency and ſeverity of the paroxyſms. Aſthmatic patients may alſo uſe the *lac ammoniaci* with a due proportion of *oxymel ſcilliticum* and *vinum antimoniale*, with a view to promote expectoration; or the gum ammoniac, and others of ſimilar virtues, may be formed into pills and combined with ſoap as mentioned for the dyſpnœa pytuitoſa; or a maſs may be compoſed of aſafœtida and balſam of Tolu, with ſyrup of garlic; and theſe pills may be waſhed down by a medicated wine, impregnated with ſquills, horſe radiſh root, and muſtard-ſeed; or a ſtrong bitter infuſion, with a little antimonial wine.

In ſome caſes crude mercury will be found ſerviceable; in others flowers of ſulphur, made into an electuary with honey or ſyrup of garlick; and if, notwithſtanding the uſe of theſe things, a coſtive habit ſhould prevail, it will be neceſſary, from time to time, to give a few grains of pills of aloes and myrrh, ſoap and aloes, or a maſs of equal parts of rhubarb, ſcammony, and ſoap.

The *dry* or *ſpaſmodic aſthma*, during the extreme violence of the fit, is beſt relieved by opiates; and ſometimes very large doſes are required. But in order to obtain permanent relief, nothing is found to anſwer better than ipecacuanha in ſmall doſes. Three, five, eight, or ten grains, according to the ſtrength and conſtitution of the patient, given every other day, have been productive of the happieſt effects; acting ſometimes as an evacuant, pumping up the viſcid phlegm; at others, as an antiſpaſmodic or ſedative. Iſſues are generally recommended in both ſpecies, and will often be found uſeful.

Changes of weather are uſually felt very ſenſibily by aſthmatic people, who in general cannot live with tolerable eaſe in the atmoſphere of large cities; though we ſhall ſometimes meet with patients who agree better with this air, which is ſo replete with groſs effluvia of various kinds, than with the pureſt that can be found in country ſituations. And ſome are found who breathe with the moſt eaſe in a crowded room, with a fire and candles.

A light diet of meats that are eaſy of digeſtion, and not flatulent, is requiſite for aſthmatic people; and the exerciſe of riding is indiſpenſibly neceſſary.

When the aſthma is found to depend on ſome other diſeaſe, whether it be the gout or an intermittent fever, or when it proceeds from the ſtriking in of ſome cutaneous eruption, regard muſt always be had to the primary diſeaſe: thus, in the *aſthma arthriticum*, ſinapiſms to the feet, or bliſtering, will be abſolutely neceſſary, in order, if poſſible, to bring on a fit of the gout. And when the dregs of an ague give riſe to an aſthma, which is termed *febriculoſum*, and invades at regular intervals, we muſt have recourſe to the Peruvian

vian bark. The *aſthma exanthematicum* will require bliſters or iſſues, to give vent to the acrid matter which were repelled from the ſurface of the body; and courſes of ſulphureous waters, goat's whey, and ſweetening diet-drinks, or perhaps mercurial alteratives in order to correct the ſharpneſs of the juices.

292 GENUS LVI. DYSPNŒA.

Habitual DIFFICULTY of BREATHING.

Dyſpnœa, *Sauv.* gen. 144. *Lin.* 160. *Vog.* 267. *Sag.* 251. *Junck.* 32.

293 Sp. I. The *Catarrhal* DYSPNOEA.

Aſthma catarrhale, *Sauv.* ſp. 16.
Aſthma pneumonicum, *Willis* Pharm. rat. P. II. ſect. i. cap. 12.
Aſthma pituitoſum, *Hoffm.* III. ſect. ii. cap. 2. § 3.
Aſthma pneumodes, *Sauv.* ſp. 17.

This is readily known by the ſymptoms of pneumonia and catarrh attending it, and to the removal of theſe ſymptoms the care of the phyſician muſt be principally directed.

294 Sp. II. The *Dry* DYSPNOEA.

Dyſpnœa a tuberculis, a hydatibus, &c. *Sauv.* ſp 2. 4. 5. 20.
Orthopnœa a lipomate, *Sauv.* ſp 18.

This is generally accompanied with a phthiſis pulmonalis; but Sauvages mentions one ſpecies of phthiſis to which the dry dyſpnœa ſeems more particularly to belong. The patients fall away by degrees, and have a great difficulty of breathing, continual thirſt, and little or no ſpitting. When opened after death their lungs are found not to be ulcerated, but ſhrivelled and contracted as if they had been ſmoke-dried. Goldſmiths and chemiſts are ſaid to be ſubject to this diſeaſe by reaſon of the vapours they draw in with their breath. Sauvages doth not mention any particular remedy. Shortneſs of breath ariſing from *tubercles*, as they are termed, or a ſcirrhous enlargement of the lymphatic glands which are diſperſed through the lungs, is commonly found in ſcrofulous habits, and may be diſtinguiſhed by the concomitancy of thoſe external ſwellings and appearances which particularly mark the ſcrofula. This ſpecies of dyſpnœa generally ends in a phthiſis. Courſes of goat's whey, and of tea-water, have been known to do ſervice; but it muſt be confeſſed, that a perfect cure is ſeldom obtained. Iſſues are of uſe in theſe caſes, as they appear to prevent the ill effects of an over fullneſs, if it ſhould happen at any time to ſupervene.

295 Sp. III. DYSPNOEA from *Changes* in the *Weather*. (*Sauv.* ſp. 12.)

This ſeems to be a diſeaſe entirely ſpaſmodic, and the antiſpaſmodics already related are accordingly indicated.

296 Sp. IV. The DYSPNOEA from *Earthy Subſtances* formed in the *Lungs*.

Sauvages mentions this diſeaſe as much more common in brutes than in the human race; but Dr Cullen mentions his having ſeen ſome inſtances of it; and we have ſeveral accounts by different authers of calculous matters being coughed up by people labouring under a dyſpnœa, and threatened with conſumption. In three caſes of this kind which fell under Dr Cullen's inſpection, there was no appearance of earthy or ſtony concretions in any other part of the body. The calcareous matter was coughed up frequently with a little blood, ſometimes with mucus only, and ſometimes with pus. In one of theſe caſes, an exquiſite phthiſis came on, and proved mortal: in the other two the ſymptoms of phthiſis were never fully formed; and after ſome time, merely by a milk diet and avoiding irritation, the patients entirely recovered.

Sauvages alſo greatly recommends milk in theſe caſes, and ſoap for diſſolving the concretions. The reaſon why brutes are more ſubject to theſe pulmonary calculi than mankind, is, that they very ſeldom cough, and thus the ſtagnating mucus of lymph concretes into a kind of gypſeous matter.

Sp. V. The *Watery* DYSPNOEA. 297

Dyſpnœa pituitoſa, *Sauv* ſp. 1.
Orthopnœa ab hydropneumonia, *Sauv* ſp. 12.

This may ariſe from too great a defluxion of mucus on the lungs, or from an effuſion of ſerum, as is mentioned under the pneumonia.. The treatment of the diſeaſe may be gathered from what has been already ſaid under the heads of peneumonia, catarrh, empyema, &c.

Sp. VI. The DYSPNOEA from *Corpulency*. 298

Othopnœa a pinguedine, *Sauv.* ſp. 6.

There have been many inſtances of ſuffocation and death occaſioned by too great corpulency. Theſe fatal effects, however, may be almoſt always avoided if the perſons have reſolution to perſiſt in an active and very temperate courſe of life; avoiding animal-food, much ſleep, and uſing a great deal of exerciſe. In the third volume of the Medical obſervations, however, there is an extraordinary inſtance of internal obeſity which neither ſhowed itſelf externally, nor could be removed by any medicines.

Other ſpecies of dyſpœna have been conſidered under PHTHISIS. It is frequently ſymptomatic of diſeaſes of the heart and large veſſels, or ſwellings of the abdomen, &c.

GENUS LVII. PERTUSSIS. 299

CHINCOUGH.

Pertuſſis *Sydenham*, Ed. Leid. p. 200. 311. 312. *Huxham*, de aere, ad. ann. 1732.
Tuſſis convulſiva, ſive ferina, *Hoffm.* III. 111.
Tuſſis ferina, *Sauv.* ſp. 10. *Sag.* ſp. 10.
Tuſſis convulſiva, *Sauv.* ſp. 11. *Sag.* ſp. 11.
Amphimerina tuſſiculoſa, *Sauv.* ſp. 13.

Deſcription. This diſeaſe comes on at firſt like a common cold; but is from the beginning attended with a greater degree of dyſpnœa than is common in catarrh; and there is a remarkable affection of the eyes, as if they were ſwelled, and a little puſhed out of their ſockets. By degrees the fits of coughing become longer and more violent, till at laſt they are plainly convulſive, ſo that for a conſiderable time the patient cannot reſpire, and when at laſt he recovers his breath, inſpiration is performed with a ſhrill kind of noiſe like the crowing of a cock. This kind of inſpiration ſerves only as an introduction to another convulſive fit of coughing, which is in like manner followed by another inſpiration of the ſame kind; and thus it continues for ſome time, very often till the patient vomit, which puts an end to the paroxyſm at that time. Theſe paroxyſms are attended with a violent determination of the blood towards the head, ſo that the veſſels become extremely turgid, and blood not unfrequently flows from the mouth and noſe. The diſeaſe is tedious, and often continues for many months. It is not commonly attended with fever.

Cauſes, &c. The chincough is an infectious diſorder, and very often epidemic: but the nature of the contagion is not underſtood; at leaſt it is no farther underſtood than that of ſmall-pox, meaſles, or ſimilar epidemics. We well know that it is from a peculiar and ſpecific contagion alone that this diſeaſe, as well as the others abovementioned, can ariſe. But with regard to the nature of any of them, we are totally in the dark. It generally attacks children, or adults of a lax habit, making its attack frequently in the ſpring or autumn; at the ſame time, when this contagion is introduced into any town, village, or neighbourhood, it will rage epidemically at any ſeaſon. Thoſe alone are affected with this diſeaſe who have never before been ſubjected to it. For in this affection, as well as in ſmall-pox, having had the diſeaſe once, gives defence againſt future contagion. Every individual, however, does not ſeem to be equally readily affected with this contagion; like other contagious diſeaſes occurring only once in a lifetime, it may naturally be expected to be more frequent among children than at any other period of life. But many, though frequently expoſed to contagion, are yet not affected with the diſeaſe: and thoſe children who live upon unwholeſome watery food, or breathe unwholeſome air, are moſt liable to its attacks, and ſuffer moſt from them. In general it has been concluded, that whatever weakens the ſolids, or tends to bring on a diſſolution of the fluids, prediſpoſes to this diſeaſe.

Prognoſis. The chincough is not very often fatal. During one epidemic, however, it is often obſerved to be much more dangerous and more ſevere than during another. This is alſo remarked with regard even to particular periods of the ſame epidemic; and it is alſo obſerved, that on certain families this diſeaſe is much more ſevere than on others. Its danger, however, is ſtill more connected with the period of life at which it occurs. In children under two years of age it is moſt dangerous; and kills them by producing convulſions, ſuffocation, inflammation and ſuppuration of the brain or in the lungs, ruptures, and incurvation of the ſpine. In pregnant women it will produce abortion; and in adults inflammations of the lungs, and all the conſequences of pneumonia, more frequently than in children. From a long continuance of the diſeaſe patients will become aſthmatic, ricketty, and ſcrofulous. It is generally reckoned a good ſign when a fit terminates by vomiting; for in this diſeaſe there ſeems to be a great increaſe of the ſecretion of mucus, and the vomiting affords great relief.

Cure. Pertuſſis is one of thoſe diſeaſes which after the contagion has exerted its influence can be terminated only by running a certain courſe: but it is much leſs limited in its courſe than ſmall pox and meaſles, and often it runs on to a very great length, or at leaſt it is very difficult to diſtinguiſh certain ſequelæ of this diſeaſe from the diſeaſe itſelf. And when it exiſts in the former of theſe ſtates, it admits of an artificial termination. In the treatment of this affection, therefore, the objects at which a practitioner chiefly aims, are in the firſt place, the obviating urgent ſymptoms, and forwarding the natural termination of the diſeaſe; and ſecondly, the inducing an artificial termination. With theſe intentions various practices are employed on different occaſions. The moſt approved remedies are vomits, purges, bleeding, and the attenuating pectorals; for the other kinds generally do hurt: but large evacuations of any kind are pernicious. In the Medical Obſervations, Vol. III. Dr Morris recommends caſtor and the bark; but in caſes attended with any degree of inflammation, the latter muſt certainly do hurt, and the former will generally be inſignificant. Dr Butter, in a diſſertation expreſsly on the ſubject, relates 20 caſes of it cured by the extract of hemlock. He directs half a grain a-day for a child under ſix months old; one grain for a child from ſix months to two years; afterwards allowing half a grain for every year of the patient's age till he be 20: beyond that period, he directs ten grains to be given for the firſt day's conſumption, gradually increaſing the doſe according to the effect. If the patient have not two ſtools a-day, he adviſes magneſia or the *lixivia vitriolata ſulphurea* to be added to the hemloek mixture. By this method he ſays the peculiar ſymptoms of the diſeaſe are removed in the ſpace of a week; nothing but a ſlight cough remaining. The uſe of hemlock, however, has by no means become univerſal in conſequence of this publication, nor indeed has this remedy been found equally ſucceſsful with others who have given it a fair trial. The remedy moſt to be depended upon in this diſeaſe is change of air. The patient, as ſoon as the diſeaſe is fully formed, ought to be removed to ſome other part of the country: but there is no occaſion for going to a diſtant place; a mile or two, or frequently a ſmaller diſtance, will be ſufficient; and in this new habitation, the frequency of the cough is almoſt inſtantly diminiſhed to a moſt ſurpriſing degree. After remaining there for ſome time, however, the cough will often be obſerved to become again more frequent, and the other ſyptoms increaſed. In this caſe, another change of air, or even a return to the former habitation, becomes neceſſary. Manifeſt benefit has even been derived by changing a patient from one room of a houſe to another. But although change of air has thus been advantageous, it muſt alſo be remarked, that when it has been had recourſe to at very early periods it has often done miſchief, particularly by aggravating the febrile and inflammatory ſymptoms. If the diſeaſe be attended with fever, bleeding and other antiphlogiſtic remedies are proper. Dr Buchan recommends an ointment made of equal parts of garlic and hog's lard applied to the ſoles of the feet; but if it have any effect, it is probably merely as an *emplaſtrum calidum*. It ought to be put on a rag and applied like a plaſter. Opiates may ſometimes

Spaſmi

be uſeful, but in general are to be avoided. They are chiefly ſerviceable where the cough is very frequent, with little expectoration. In theſe caſes benefit has ſometimes alſo been derived from vitriolic ether, and ſometimes from the tincture of cantharides. An almoſt inſtantaneous termination has on ſome occaſions been put to this diſeaſe by exciting a high degree of fear, or by inducing another febrile contagion: But the effects of both are too uncertain and too dangerous to be employed in practice.

300 Genus LVIII. PYROSIS.

The Heart-Burn.

Pyroſis, *Sauv.* gen. 200. *Sag.* 158.
Soda, *Lin.* 47. *Vog.* 154.
Scotis, the Water-Brash.
Pyroſis Suecica, *Sauv.* ſp. 4.
Cardialgia ſputatoria, *Sauv.* ſp. 5.

This diſeaſe, whether conſidered as primary or ſymptomatic, has already been fully treated under Dyspepsia.

301 Genus LIX. COLICA.

The Colic.

Colica, *Sauv.* gen. 204. *Lin.* 50. *Vog.* 160. *Sag.* 162. *Junck.* 106.
Colica ſpaſmodica et flatulenta, *Hoffm.* II. 284.
Rachialgia, *Sauv.* gen. 211. *Sag.* 168.
Ileus, *Sauv.* gen. 252. *Vog.* 162. *Sag.* gen. 187.
Iliaca, *Lin.* 185.
Dolor et ſpaſmus iliacus, *Hoffm.* II. 263.
Paſſio iliaca, *Junck.* 107.

302 Sp. I. *The Spaſmodic* Colic.

Colica flatulenta, pituitoſa, &c. *Sauv.* ſp. 1. 2. 5. 6. 7. Ileus phyſodes, volvulus, inflammatorius, &c. *Ejuſd.* ſp. 1. 3. 5. 7. 8. 9.

Deſcription. The colic is chiefly known by a violent pain in the abdomen, commonly about the umbilical region. The pain reſembles various kinds of ſenſations, as of burning, twiſting, boring, a ligature drawn very tight, &c. The belly is generally coſtive, though ſometimes there is a violent evacuation of bilious matters upwards and downwards. In theſe caſes the diſeaſe is ſometimes accompanied from the beginning with a weak and intermitting pulſe, cold ſweats, and fainting. In ſome the diſeaſe comes on gradually, beginning with an habitual coſtiveneſs; and if purgatives be taken, they do not operate. The pain comes on generally after a meal, and ſoon occaſions nauſea and vomiting. Sometimes the diſeaſe is attended with pyrexia, violent thirſt, and a full pulſe; the vomiting becomes more violent, and excrementitious matters are thrown up with moſt exquiſite pain and tenſion of the abdomen; an hickup comes on, which continues obſtinately; till at laſt a ceſſation of pain and fetid breath indicate a mortification of the inteſtines and approaching death. Sometimes the periſtaltic motion of the inteſtines is ſo totally inverted, that all their contents are evacuated by the mouth, and even clyſters will be vomited; which conſtitutes that diſeaſe commonly called the *iliac paſſion.*

Colica.

Cauſes, &c. Colics may ariſe from any ſudden check given to perſpiration, as by violent cold applied to any part of the body, eſpecially to the lower extremities and abdomen. Very frequently they are occaſioned by auſtere, acid, or indigeſtible aliments taken into the ſtomach. By any of theſe, a violent colic, or indeed an iliac paſſion, may be occaſioned; for Dr Cullen juſtly obſerves, that this laſt, though commonly accounted a different ſpecies of diſeaſe, differs from a colic in no other way than in being in every reſpect in a much higher degree. In thoſe who have died of this diſeaſe and been diſſected, the inteſtines have ſometimes been found twiſted; but more commonly there hath been an *introſuſception* of the inteſtine, that is, one part of the gut ſeems to have entered within the other. In the Edinburgh Medical Eſſays, Vol. III. we have a diſſertation on the uſe of the warm bath in the bilious colic, in which the author derives the diſorder from a ſpaſmodic conſtriction of the inteſtine occaſioned by the acrimony of the bile. By this, he ſays, the inteſtine is not only contracted into an unuſual narrowneſs, but coats of it have been found, upon diſſection, ſo cloſely joined, that no paſſage could be made downwards more than if they had been ſtrongly tied by a ligature. The formation of the *introſuſceptio* he explains by quoting a paſſage from Peyerus, who made the following experiment on a frog. Having irritated the inteſtine of the animal in ſeveral different places, he obſerved it to contract at thoſe places moſt violently, and to protrude its contents upwards and downwards wherever the relaxed ſtate of the part would permit; by which means the contents were heaped together in different parts. Hence ſome parts of the inteſtine being dilated much more than enough, by reaſon of the great quantity of matter thrown into them, formed a kind of ſack which readily received the conſtricted part into it. If this happen in the human body, there is the greateſt danger of a mortification; becauſe the part which is conſtricted, and at any rate diſpoſed to inflammation, has that diſpoſition very much increaſed by its confinement within the other, and by the preſſure of the contents of the alimentary canal from the ſtomach downwards upon it. An iliac paſſion may alſo ariſe from the ſtrangulation of part of the inteſtine in a hernia; and even a very ſmall portion of it thus ſtrangulated may occaſion a fatal diſeaſe. In the Medical Obſervations, Vol. IV. however, we have an acount of an iliac paſſion ariſing from a very different cauſe, which could neither have been ſuſpected nor cured by any other way than the operation of *gaſtrotomy*, or opening the abdomen of the patient, in order to remove the cauſe of the diſorder. The patient a woman of about 28 years of age, died after ſuffering extreme torture for ſix days. The body being opened, ſome quantity of a dirty coloured fluid was found in the cavity of the abdomen. The jejunum and ileum were greatly diſtended with air. A portion of the omentum, adhered to the meſentery, near that part where the ileum terminates in the cæcum. From this adheſion, which was cloſe to the ſpine, there ran a ligamentous cord or proceſs about two inches and a half long, unequally thick, in ſome places not thicker than a packthread; which by its other extremity adhered to the coats of the ileum, about two inches above the cæcum. This cord formed a circle with the meſentery, large enough to admit a hen's egg to paſs through it. The chord had formed a nooſe (in a manner difficult to be explained), which included a doubling of about two inches of the lower end of the ileum; and was drawn ſo tight, that it not only put a ſtop to the paſſage of every thing through the bowels and brought on a gangrene of the ſtrangulated part, but it had even cut through all the coats of the inteſtine on the oppoſite ſide to the meſentery, and made an aperture about an inch long. In the Memoirs of the Academy of Surgery are mentioned ſeveral ſimilar caſes.

Prognoſis. The colic is never to be reckoned void of danger, as it may unexpectedly terminate in an inflammation and gangrene of the inteſtines. Thoſe ſpecies of it which are attended with purging muſt be conſidered as much leſs dangerous than thoſe in which the vomiting is very violent. The iliac paſſion, or that attended with the vomiting of feces, is always to be accounted highly dangerous; but if the paſſage through the inteſtines be free, even though their periſtaltic motion ſhould be inverted, and clyſters evacuated by the mouth, there is much more hope of a cure, than when the belly is obſtinately coſtive, and there is ſome fixed obſtruction which ſeems to bid defiance to all remedies.

Cure. In the cure of the ſpaſmodic colic, the recovery muſt ultimately depend on producing a reſolution of the ſpaſmodic affection. In order to accompliſh this, it is in general neceſſary to evacuate the contents of the inteſtines, and to remove morbid irritability exiſting in that part of the ſyſtem. But in order to preſerve the life of the patient from the moſt imminent hazard, it is ſtill more neceſſary to prevent and remove thoſe inflammatory affections which often occur in this diſeaſe. As the chief danger in colics ariſes from an inflammation and conſequent mortification of the inteſtines, it is eſſentially neceſſary, in the firſt place, to diminiſh the tendency to a pyrexia, if there ſhould happen to be any. This is accompliſhed by bleeding, emollient injections, warm bathing, and cooling medicines taken inwardly. Dr Porter, in the eſſay abovementioned, ſtrongly recommends the warm bath in thoſe colics attended with violent evacuations of bile. He ſuppoſes it to do ſervice by relaxing the conſtriction of the inteſtines, and thus preventing or removing the introſuſceptio. In the mean time opiates may be given to eaſe the pain, while every method is tried, by cathartics and glyſters of various kinds, to procure a ſtool. In obſtinate caſes, where ſtimulating cathartics have proved ineffectual, the milder kinds, ſuch as manna, ſenna, oleum ricini, &c. will ſucceed; but where every thing of this kind fails, recourſe muſt be had to ſome of the more extraordinary methods. Some have recommended the ſwallowing of leaden bullets, on a ſuppoſition that by their weight they would force through the obſtruction into the gut; but theſe ſeem much more likely to create than to remove an obſtruction. It is impoſſible they can act by their gravity, becauſe the inteſtines do not lie in a ſtraight line from the pylorus to the anus; and though this were actually the caſe, we cannot ſuppoſe that the weight of a leaden bullet could prove very efficacious in removing either a ſpaſmodic conſtriction or an obſtruction from any other cauſe. But when we conſider, not only that the inteſtines conſiſt of a great multitude of folds, but that their periſtaltic motion (by which only the contents are forced through them) is inverted, the futility of this remedy muſt be evident. It might rather be ſuppoſed to aggravate the diſeaſe; as the lead, by its preſſure would tend to fix the introſuſception more firmly, or perhaps puſh it ſtill further on. The ſame thing may be ſaid of quickſilver: not to mention the pernicious conſequences to be apprehended from ſwallowing large quantities of this mineral, even if it ſhould prove efficacious in relieving the patient for the preſent. There are, however, ſome late caſes on record, particularly one by Mr William Perry, publiſhed in the ſixteenth volume of the Edinburgh Medical Commentaries, in which the hydrargyrus, ſwallowed in great quantities, was attended with the happieſt effects after every other remedy had been tried in vain. Another method has been propoſed, in the Medical Eſſays, for relieving the miſerable patients in this diſorder, which in many caſes has been known to do ſervice. The patient is to be taken out of bed, and made to walk about on the cold floor of a damp apartment. At the ſame time, porringers of cold water are to be daſhed on his feet, legs, and thighs; and this muſt be continued for an hour or longer, if a ſtool be not procured before that time, though this will generally be the caſe much ſooner. The exerciſe does not at all impair the patient's ſtrength, but rather adds to it; and ſome very remarkable inſtances are adduced in the 6th volume of the Medical Eſſays, where this proved effectual after all other medicines had failed. In one perſon the diſeaſe had come on with an habitual coſtiveneſs, and he had been for a week tormented with the moſt violent pain and vomiting, which could be ſtopped neither by anodynes nor any other medicines, the ſharpeſt clyſters being returned unaltered, and all kinds of purgatives thrown up ſoon after they were ſwallowed; but by the abovementioned method, a ſtool was procured in 35 minutes, and the patient recovered. In ſome others the coſtiveneſs had continued for a much longer time.—Other remedies are, the blowing air into the inteſtines by means of a bellows, and the injecting clyſters of the ſmoke of tobacco. But neither of theſe ſeem very capable of removing the diſeaſe. They can affect only the parts below the obſtruction; while, to cure the diſeaſe, it is neceſſary that the obſtructed parts themſelves ſhould be reached by the medicine, and therefore we have not many well-atteſted inſtances of their ſucceſs. In ſome obſtinate caſes, however, benefit has certainly been derived from tobacco-ſmoke injections, and likewiſe from injections of tepid water to the extent of ſeveral pounds. For putting in practice theſe modes of cure a particular apparatus have been contrived; and in caſes even apparantly deſperate, neither ſhould be neglected. The cold water gives a general and very conſiderable ſhock to the ſyſtem, checks the perſpiration, and thus drives the humors inward upon the inteſtines, by which they receive a much more effectual ſtimulus than can be ſuppoſed to ariſe from any kind of clyſter. But when all methods have failed, the only chance the patient can have for life is by a manual operation.

In thoſe colics which are attended with faintings,

&c. from the beginning, and which generally attack hyſteric women and other debilitated perſons, all kinds of evacuations are pernicious; and the cure is to be attempted by anodynes and cordials, which will ſeldom fail of ſucceſs. Even there alſo, however, it is neceſſary that the belly ſhould be moved; and for this purpoſe injections, containing a ſolution of aſafœtida, which operate powerfully as antiſpaſmodics, are preferable to moſt other modes of cure.

303 Sp. II. Colica Pictonum. *The Colic of Poictou.*

Rachialgia Pictonum, *Sauv.* ſp. 1.
Rachialgia metallica, *Sauv.* ſp. 3.
Colica Pictonum *Citeſii et ſuccedentium auctorum.*

Another cauſe to which violent colics are frequently to be aſcribed, and which often gives occaſion to them where it is very little ſuſpected, is lead, or ſome ſolution or fume of it, received into the body. To this cauſe is evidently owing the colics to which plumbers, lead-miners, and ſmelters of lead, are ſubject. To the ſame cauſe, though not ſo apparent at firſt ſight, are we to aſcribe the Devonſhire colic, where lead is received into the body diſſolved in cyder, the common drink of the inhabitants of that country. This has been proved by experiment; for lead has been extracted from cyder in quantity ſufficient to produce pernicious effects on the human body. The colic of Poictou and what is called the *dry belly-ache* in the Weſt Indies, are of the ſame nature; for which reaſon we give the following general deſcription of the ſymptoms of all theſe diſeaſes.

The patient is generally firſt ſeized with an acute pain at the pit of the ſtomach, which extends itſelf down with griping pains to the bowels. Soon after there is a diſtenſion, as with wind; and frequent reachings to vomit, without bringing up any thing but ſmall quantities of bile and phlegm. An obſtinate coſtiveneſs follows, yet ſometimes attended with a teneſmus, and the bowels ſeem to the patient as if they were drawn up towards the back; at other times they are drawn into hard lumps, or hard rolls, which are plainly perceptible to the hand on the belly, by ſtrong convulſive ſpaſms. Sometimes the coats of the inteſtines ſeem to be drawn up from the anus and down from the pylorus towards the navel. When a ſtool is procured by artificial means, as clyſters, &c. the feces appear in little hard knots like ſheep's dung, called *ſcybala*, and are in ſmall quantity. There is, however, uſually an obſtinate coſtiveneſs; the urine is diſcharged in ſmall quantity, frequently with pain and much difficulty. The pulſe is generally low, though ſometimes a little quickened by the violence of the pain; but inflammatory ſymptoms very ſeldom occur. The extremities are often cold, and ſometimes the violence of the pain cauſes cold clammy ſweats and fainting. The mind is generally much affected, and the ſpirits are ſunk. The diſeaſe is often tedious eſpecially if improperly treated, inſomuch that the patients will continue in this miſerable ſtate for twenty or thirty days ſucceſſively; nay, inſtances have been known of its continuing for ſix months. In this caſe the pains at laſt become almoſt intolerable: the patient's breath acquires a ſtrong fetid ſmell like excrements, from a retention of the feces, and an abſorption of the putrid effluvia from them by the lacteals. At laſt, when the pain in the bowels begins to abate, a pain comes on in the ſhoulder-joints and adjoining muſcles, with an unuſual ſenſation and tingling along the ſpinal marrow. This ſoon extends itſelf from thence to the nerves of the arms and legs, which become weak; and that weakneſs increaſes till the extreme parts become paralytic, with a total loſs of motion, though a benumbed ſenſation often remains. Sometimes, by a ſudden metaſtaſis, the brain becomes affected, a ſtupor and delirum come on, and the nervous ſyſtem is irritated to ſuch a degree as to produce general convulſions, which are frequently followed by death. At other times, the periſtaltic motion of the inteſtines is inverted, and a true iliac paſſion is produced, which alſo proves fatal in a ſhort time. Sometimes the paralytic affection of the extremities goes off, and the pain of the bowels returns with its former violence; and on the ceſſation of the pain in the inteſtines, the extremities again become paralytic and thus the pain and palſy will alternate for a very long time.

Cure. Various methods have been attempted for removing this terrible diſeaſe. The obſtinate coſtiveneſs which attends it, made phyſicians at firſt exhibit very ſtrong purgatives and ſtimulating clyſters. But theſe medicines, by increaſing the convulſive ſpaſms of the inteſtines, were found to be pernicious. Balſam of Peru, by its warm aromatic power, was found to ſucceed much better; and Dr Sydenham accordingly preſcribed it in the quantity of 40 drops twice or thrice a day taken on ſugar. This, with gentle purgatives, opiates, and ſome drops of the hotter eſſential oils, continued to be the medicine commonly employed in this diſeaſe, till a ſpecific was publiſhed by Dr Lionel Chalmers of South Carolina. This receipt was purchaſed by Dr Chalmers from a family where it had long been kept a ſecret. The only unuſual medicine in this receipt, and on which the efficacy of it chiefly if not wholly depends, is vitriolated copper. This muſt be diſſolved in water, in the quantity of one grain to an ounce, and the doſe of the ſolution is a wine-glaſsful given faſting for nine ſucceſſive mornings. For the firſt four or five days this medicine diſcharges much æruginous bile both ways. but the excretions of this humour leſſen by degrees and before the courſe be ended, it has little other effect than to cauſe ſome degree of ſqueamiſhneſs, or promote a few bilious ſtools, or perhaps may not move the patient at all. At the time of uſing this medicine the patients ſhould live upon broth made of lean meat, gruel, or panada: but about the ſeventh or eighth day, they may be allowed bread and boiled chicken. Here the copper ſeems to do ſervice by its tonic power; and for the ſame reaſon, alum, recommended by Dr Percival, moſt probably cures the diſeaſe. He ſays he has found this very efficacious in obſtinate affections of the bowels, and that it generally proves a cure in the ſlighter caſes of the colica pictonum. It was given to the quantity of fifteen grains every fourth, fifth, or ſixth hour; and the third doſe ſeldom failed to mitigate the pain, and ſometimes entirely removed it. Among purgative medicines, the *oleum Ricini* is found to be the moſt efficacious.

304 Sp. III. The Colic from Coſtiveneſs.

Colica ſtercorea, *Sauv.* ſp. 3.
Ileus a fæcibus induratis, *Sauv.* ſp. 2.

For the treatment of this ſpecies, ſee above.

Sp. IV. The *Accidental Colic.*

Colica Japonica,—accidentalis,—lactentium,—a veneno, *Sauv.* ſp. 10. 14. 18. 20.
Cholera ſicca auriginoſa a fungis venenatis, *ejuſd.* ſp. 2.

When cholics ariſe from acrid poiſonous matter taken into the ſtomach, the only cure is either to evacuate the poiſon itſelf by vomiting, or to ſwallow ſome other ſubſtance which may decompound it, and thus render it inactive. The moſt common and dangerous ſubſtances of this kind are corroſive mercury and arſenic. The former is eaſily decompounded by alkaline ſalts; and therefore a ſolution of lixivial ſalt, if ſwallowed before the poiſon has time to induce a mortification of the bowels, will prove a certain cure. Much more uncertain, however, is the caſe when arſenic is ſwallowed, becauſe there is no certain and ſpeedy ſolvent of that ſubſtance yet known. Milk has been recommended as efficacious; and lately a ſolution of *hepar ſulphuris*. The latter may poſſibly do ſervice; as arſenic unites readily with ſulphur, and has its pernicious qualities more obtunded by that than by any other known ſubſtance: but indeed, even the ſolvent powers of this medicine are ſo weak, that its effects as well as thoſe of others muſt be very uncertain.

Some kinds of fungi, when ſwallowed, are apt to produce colics attended with ſtupor, delirium, and convulſions; and the ſame ſometimes happens from eating a large quantity of the ſhell-fiſh known, by the name of muſcles (the Mytulus). Some of the fungi, doubtleſs, may have an inherent poiſonous quality; but generally they as well as the muſcles act on a different principle. Their pernicious effects happen moſt commonly when they are taken on an empty ſtomach; and are then ſuppoſed to be occaſioned by their adhering ſo cloſe to its coats, that it cannot exert its powers, and the whole ſyſtem is thrown into the utmoſt diſorder. The malady may therefore be very eaſily prevented; but when once it has taken place, it cannot be removed till either a vomiting be excited, or the ſtomach has recovered itſelf in ſuch a manner as to throw off the adhering matter.

305 Sp. V. Colic of *New-born Infants* from a *Retention* of the *Meconium*. (*Sauv.* ſp. 19.)

This diſorder would be prevented were children allowed immediately to ſuck their mothers, whoſe milk at firſt is purgative. But as this is not commonly done, the child is frequently troubled with colics. Theſe, however, may be removed by a few grains of ipecacuanha, or a drop or two of antimonial wine. By theſe means the ſtomach is cleanſed by vomiting, and the belly is generally looſened; but if this laſt effect does not happen, ſome gentle purge will be neceſſary.

306 Sp. VI. Colic from a *Calloſity* of the *Colon.*

It is in a manner impoſſible to diſcover this diſtemper before the patient's death; and though it ſhould, it does not admit of a cure.

Sp. VII. The Colic from *Inteſtinal Calculi* (*Sauv.* ſp. 10. 15.) 307

When certain indigeſtible bodies, ſuch as cherry ſtones, plum-ſtones, ſmall pieces of bones, &c. are ſwallowed, they frequently prove the baſis of calculi, formed by an accretion of ſome kind of earthy matter; and being detained in ſome of the flexures of the inteſtines, often occaſion very violent colics. Theſe calculi do not diſcover themſelves by any peculiar ſymptoms, nor do they admit of any particular method of cure. In the Medical Eſſays we have an inſtance of colics for ſix years, occaſioned by calculi of this kind. The concretions were at laſt paſſed by ſtool; and their paſſage was procured by cauſing the patient drink a large quantity of warm water, with a view to promote the evacuation of bile, a redundancy of which was ſuppoſed to be the cauſe of her diſorder.

Genus LX. CHOLERA, the Cholera Morbus. 308

Cholera, *Sauv.* 253. *Lin.* 186. *Vog.* 110. *Sag.* 188. *Hoffm.* II. 165.
Diarrhœa cholerica, *Junck.* 112.

Sp. I. The *Spontaneous Cholera*, coming on without any manifeſt cauſe. 309

Cholera ſpontanea, *Sauv.* ſp. 1. *Sydenh.* ſect. iv. cap. 2.
Cholera Indica, *Sauv.* ſp. 7.

Sp. II. The *Accidental Cholera*, from acrid matters taken inwardly. 310

Cholera crapuloſa, *Sauv.* ſp. 11.
Cholera a venenis, *Sauv.* ſp. 4. 5.

The cholera ſhows itſelf by exceſſive vomiting and purging of bilious matters, with violent pain, inflation and diſtenſion of the belly. Sometimes the patients fall into univerſal convulſions; and ſometimes they are affected with violent ſpaſms in particular parts of the body. There is a great thirſt, a ſmall and unequal pulſe, cold ſweats, fainting, coldneſs of the extremities, and hiccough; and death frequently enſues in 24 hours.

In this diſeaſe, as a larger quantity of bile is depoſited in the alimentary canal, particularly in the ſtomach, the firſt object is to counteract its influence, and to promote an eaſy diſcharge, of it. It is next neceſſary to reſtrain that increaſed ſecretion of bile, by which a freſh depoſition in the alimentary canal would otherwiſe be ſoon produced. And, in the laſt place, meaſures muſt often be employed to reſtore a ſound condition to the alimentary canal, which is frequently much weakened by the violence of the diſeaſe.

On theſe grounds, the cure of this diſtemper is effected by giving the patient a large quantity of warm water, or very weak broth, in order to cleanſe the ſtomach of the irritating matter which occaſions the diſeaſe, and injecting the ſame by way of clyſter, till the pains begin to abate a little. After this, a large doſe of laudanum is to be given in ſome convenient vehicle, and repeated as there is occaſion. But if the vomiting and purging have continued for a long time before the phyſician be called, immediate recourſe muſt be had to the laudanum, becauſe the patient will be too much exhauſted to bear any further evacuations. Sometimes the propenſity to vomit is ſo ſtrong, that nothing will be retained, and the laudanum itſelf thrown up as ſoon as ſwallowed. To ſettle the ſtomach in theſe caſes, Dr Douglas, in the Medical Eſſays, recommends a decoction of oat-bread toaſted as brown as coffee; and the decoction itſelf ought to be of the colour of weak coffee. He ſays he does not remember that this decoction was ever vomited by any of his patients. An infuſion of mint-leaves or good ſimple mint-water is alſo ſaid to be very efficacious in the ſame caſe.

The tincture of opium is ſometimes retained when given in conjunction with a portion of the vitriolic acid properly diluted. But when it cannot be retained in a fluid form by the aid of any addition, it will ſometimes ſit upon the ſtomach when taken in a ſolid ſtate.

After the violence of the diſeaſe is overcome, the alimentary canal, and the ſtomach in particular, requires to be braced and ſtrengthened. With this view recourſe is often had with advantage to different vegetable bitters, particularly to the uſe of the colombo root; which, while it ſtrengthens the ſtomach, is alſo obſerved to have a remarkable tendency in allaying a diſpoſition to vomiting, which often remains for a conſiderable time after the cholera may be ſaid to be overcome.

311 GENUS LXI. DIARRHOEA.
LOOSENESS.

Diarrhœa, *Sauv.* gen. 253. *Lin.* 187. *Vog.* 105. *Sag.* gen. 189. *Junck.* 112.
Hepatirrhœa, *Sauv.* gen. 246.
Cholerica, *Lin.* 190.
Cœliaca, *Sauv.* gen. 255. *Lin.* 189. *Vog.* 109. *Sag.* gen. 199.
Lienteria, *Sauv.* gen. 256. *Lin.* 188. *Sag.* gen. 191. *Vog.* 108.
Pituitaria, & leucorrhois, *Vog.* 111. 112.

312 Sp. I. The *Feculent* DIARRHOEA.

Diarrhœa ſtercoroſa & vulgaris, *Sauv.* ſp. 1. 2.

THIS is occaſioned by the too great quantity of matter thrown into the alimentary canal; and what is diſcharged has not the appearance of excrements, but is much whiter, and of a thinner conſiſtence. Voracious people who do not ſufficiently chew their food, gormandizers, and even thoſe who ſtammer in their ſpeech, are ſaid to be liable to this diſeaſe. In ſlighter caſes it is removed without any medicine, or by a doſe of rhubarb; but where the matters have acquired a putrid taint, the diſorder may be exceedingly protracted and become dangerous. In this caſe lenient and antiſeptic purgatives are to be made uſe of, after which the cure is to be completed by aſtringents.

313 Sp. II. The *Bilious* DIARRHOEA.
(*Sauv.* ſp. 3.)

This diſtemper ſhews itſelf by copious ſtools of a very yellow colour, attended with gripes and heat of the bowels, thirſt, bitterneſs, and dryneſs of the mouth, yellowneſs of the tongue, and frequently follows an intermitting or bilious fever. When the fever is gone, the diarrhœa is to be removed by acidulated and cooling drinks, with ſmall doſes of nitre.

Sp. III. The *Mucous* DIARRHOEA. 314

Diarrhœa lactentium, *Sauv.* ſp. 19.
Dyſenteria Pariſiaca, *Sauv.* ſp. 3.
Diarrhœa ab hypercatharſi, *Sauv.* ſp. 16.
Dyſenteria a catharticis, *Sauv.* ſp. 12.
Pituitaria, *Vog.* 111.
Leucorrhois, *Vog.* 112.
Diarrhœa pituitoſa, *Sauv.* ſp. 4.
Cœliaca mucoſa, *Sauv.* ſp. 5.
Diarrhœa ſeroſa, *Sauv.* ſp. 10.
  a. Diarrhœa urinoſa.

This kind of diarrhœa, beſides the matters uſually excreted, is attended with a copious dejection of the mucus of the inteſtines with great pain; while the patient daily pines away, but without any fever.—Perſons of all ages are liable to it, and it comes on uſually in the winter-time; but is ſo obſtinate, that it will ſometimes continue for years. In obſtinate looſeneſſes of this kind, vomits frequently repeated are of the greateſt ſervice. It is alſo very beneficial to keep the body warm, and rub the belly with ſtimulating ointments; at the ſame time that aſtringent clyſters, rhubarb, and ſtomachic medicines, are to be exhibited. Starch clyſters are very often efficacious.—Some kinds of looſeneſs are contagious; and Sir John Pringle mentions a ſoldier who laboured under an obſtinate diarrhœa, who infected all thoſe that uſed the ſame privy with himſelf. In the looſeneſs which frequently followed a dyſentery, the ſame author tells us that he began the cure with giving a vomit of ipecacuanha, after which he put the patients on a courſe of aſtringents. He uſed a mixture of three drachms of extract of logwood, diſſolved in an ounce and a half of ſpirit of cinnamon, to which was added ſeven ounces of common water, and two drachms of tincture of catechu. Of this the patient took two ſpoonfuls once in four or five hours, and ſometimes alſo an opiate at bed-time. He recommends the ſame medicine in obſtinate diarrhœas of all kinds. A decoction of ſimaruba bark was alſo found effectual, when the dyſenteric ſymptoms had gone off. Dr Huck, who uſed this article in North-America, alſo recommends it in diarrhœas. Two or three ounces of the ſimaruba are to be boiled in a pound and a half of water to a pound, and the whole quantity taken throughout the day. He began with the weakeſt decoction; and, when the ſtomach of the patient could eaſily bear it, he then ordered the ſtrongeſt: but at the ſame time he acknowledges, that, unleſs, the ſick found themſelves ſenſibly better within three days from the time they began the medicine, they ſeldom afterwards received any benefit from it. But when all aſtringents have failed, Sir John Pringle informs, us, he hath known a cure effected by a milk and farinaceous diet; and he thinks in all caſes the diſorder would be much more eaſily removed, if the patients could be prevailed on to abſtain entirely from ſpirituous liquors and animal-food. If the milk by itſelf ſhould turn ſour on the ſtomach, a third part of lime-water may be added. In one caſe he found a patient receive more benefit from good butter-milk than from ſweet-milk. The chief drinks are decoctions of barley, rice, calcined hartſhorn, toaſt and water, or milk and water.

315 Sp. IV. The COELIAC PASSION.

Cœlica chyloſa, *Sauv.* ſp. 1.
Cœlica lactea, *Sauv.* ſp. 4.

There are very great differences among phyſicians concerning the nature of this diſeaſe. Sauvages ſays, from Aretæus, it is a chronic flux, in which the aliment is diſcharged half digeſted. It is attended with great pains of the ſtomach, reſembling the pricking of pins; rumbling and flatus in the inteſtines; white ſtools becauſe deprived of bile, while the patient becomes weak and lean. The diſeaſe is tedious, periodical, and difficult to be cured. Sauvages adds, that none of the moderns ſeem to have obſerved the diſeaſe properly; that the excrements indeed are white, on account of a deficiency of the bile, but the belly is bound as in the jaundice. Dr Cullen ſays there is a dejection of a milky liquid of the nature of chyle; but this is treated by Vogel as a vulgar error. He accuſes the moderns of copying from Aretæus, who mentions white fæces as a ſymptom of the diſtemper; from whence authors have readily fallen into the notion that they never appeared of any other colour in perſons labouring under the cœliac paſſion. This error quickly produced another, which has been very generally received; namely, that the chyle was thrown out of the lacteals by reaſon of ſome obſtruction there, and thus paſſed along with the excrements; of which he ſays there is not the leaſt proof, and agrees with Aretæus that the whiteneſs is only occaſioned by the want of bile. He endeavours to prove at length, that the cœliac paſſion can neither be occaſioned by an obſtruction of the lacteals, nor of the meſenteric glands; though he owns that ſuch as have died of this diſeaſe and were diſſected, had obſtructions in the meſenteric glands; but he denies that all thoſe in whom ſuch obſtructions occur, are ſubject to the cœliac paſſion. He conſiders the diſtemper as ariſing from a cachexy of the ſtomachic and inteſtinal juices; and directs the cure to be attempted by emetics, purgatives, antiſeptics and tonics, as in other ſpecies of diarrhœa.

316 Sp. V. The LIENTERY.

Lienteria ſpontanea, *Sauv.* ſp. 2.

The lientery, according to Sauvages, differs from the cœliac paſſion only in being a ſlighter ſpecies of the diſeaſe. The aliment paſſes very quickly through the inteſtines, with ſcarce any alteration. The patients do not complain of pain, but are ſometimes affected with an intolerable hunger. The cure is to be attempted by ſtomachics and tonics, eſpecially the Peruvian bark. This diſeaſe is moſt common at the earlier periods of life; and then rhubarb in ſmall quantities, particularly when combined with magneſia, is often productive of the beſt effects.

Sp. VI. The *Hepatic Flux.* 317

Hepatirrhœa inteſtinalis, *Sauv.* ſp. 2.

The hepatic diarrhœa is by Sauvages deſcribed as a flux of bloody ſerous matter like the waſhings of fleſh, which percolates through the coats of the inteſtines by means of the anaſtomoſing veſſels. It is the cœliac paſſion of Trallianus; and which, according to Sauvages, rarely, if ever, occurs as a primary diſeaſe. It has, however, been obſerved to follow an inflammation of the liver, and then almoſt always proves fatal.

GENUS LXII. DIABETES. 318

A profuſe diſcharge of URINE.

Diabetes, *Sauv.* gen. 263. *Lin.* 197. *Vog.* 115. *Sag.* gen. 199. *Junck.* 99. *Dobſon*, Med. Obſervat. Vol. V. p. 298. *Home*'s Clinical Experiments, ſect. xvi.
Diureſis, *Vog.* 114.

Sp. I. The DIABETES with *ſweet Urine.* 319

Diabetes Anglicus, *Sauv.* ſp. 2. *Mead* on Poiſons, Eſſay I. Ejuſdem Monita Med. cap. ix. ſect. 2. *Dobſon* in Lond. Med. obſerv. Vol. V. art. 27. *Myers* Diſſ. inaug. de Diabete, Edinb. 1779.
Diabetes febricoſus, *Sauv.* ſp. 7. *Sydenh.* Ep. reſp. ad R. Brady.

Sp. II. DIABETES with *inſipid Urine.* 320

M. Liſter Exerc. Medicin. II. de Diabete.
Diabetes legitimus, *Sauv.* ſp. 1. *Aretæus* de Morb. diuturn. lib. ii. cap. 2.
Diabetes ex vino, *Sauv.* ſp. 5. *Ephem. Germ.* D. I. A. II. Obſerv. 122.

Deſcription. The diabetes firſt ſhows itſelf by a dryneſs of the mouth and thirſt, white frothy ſpittle, and the urine in ſomewhat larger quantity than uſual. A heat begins to be perceived in the bowels, which at firſt is a little pungent, and gradually increaſes. The thirſt continues to augment by degrees, and the patient gradually loſes the power of retaining his urine for any length of time. It is remarkable, that though the patients drink much, the quantity of urine always exceeds what is drank. In Dr Home's Clinical Experiments we have an account of two patients labouring under this diſeaſe; one of them drank between 10 and 12 Engliſh pints a-day without being ſatisfied. The quantity was greater in the forenoon than in the afternoon. In the other the caſe was reverſed. He drank about four pints a-day, and more in the afternoon than the forenoon. The former paſſed from 12 to 15 pints of urine in the day: the latter, 11 or 12; ſo that his urine always exceeded his drink by eight, or at leaſt ſeven pints. When the urine is retained a little while, there is a ſwelling of the loins, illia, and teſtes; in this diſeaſe the ſtrength gradually decays; the ſkin is dry and ſhrivelled; œdematous ſwellings ariſe in various parts of the body, but afterwards ſubſide without relieving the diſeaſe in the leaſt; and the patient is frequently carried off by convulſions.

The moſt ſingular phenomenon in this diſeaſe is, that the urine ſeems, to be entirely or very much diveſted of an animal-nature, and to be largely impregnated with a ſaccharine ſalt ſcarce diſtinguiſhable from that obtained from the ſugar-cane. This diſcovery was firſt made by Dr Dobſon of Liverpool, who made ſome experiments on the urine of a perſon labouring under a diabetes, who diſcharged 28 pints of urine every day, taking during the ſame time from 12 to 14 pounds of ſolid and liquid food. Some of this urine being ſet a-ſide, fell into a ſpontaneous effervesſcence, changed firſt into a vinous liquor, and afterwards into an acetous one, before it became putrid and offenſive. Eight ounces of blood taken from the ſame patient, ſeparated into craſſamentum and ſerum; the latter being ſweet to the taſte, but leſs ſo than the urine. Two quarts of the urine, evaporated to dryneſs, left a white cake weighing four ounces two drachms and two ſcruples. This cake was granulated, and broke eaſily between the fingers: it ſmelled ſweet like brown ſugar; neither could it by the taſte be diſtinguiſhed from ſugar, except that it left a ſlight ſenſe of coolneſs on the tongue. The experiment was repeated after the patient was recovered to ſuch a degree as to paſs only 14 pints of urine a-day. There was now a ſtrong urinous ſmell during the evaporation; and the reſiduum could not be procured in a ſolid form, but was blackiſh, and much reſembled very thick treacle. In Dr Home's patients, the ſerum of the blood had no preternatural ſweetneſs; in one of them the craſſamentum was covered with a thick inflammatory cruſt. In one of theſe patients the urine yielded an ounce and a half, and in the other an ounce, of ſaccharine matter from each pound. It had, however, an urinous ſmell, and a ſaline taſte mixed with the ſweet one; and the urine of one fermented with yeaſt, we are told, into "tolerable ſmall-beer." Both theſe patients had a voracious appetite, and perpetual gnawing ſenſe of hunger; as had alſo Dr Dobſon's patient. The inſipid urine of thoſe affected with diabetes has not been examined by phyſicians with ſufficient accuracy to enable us to ſpeak with confidence of its contents.

Cauſes. Theſe are exceedingly obſcure and uncertain; ſpaſms of the nervous ſyſtem, debility, and every thing inducing it, but eſpecially ſtrong diuretics and immoderate venery, have been accuſed as bringing on the diabetes. It has, however, occured in perſons where none of all theſe cauſes could be ſuſpected; nor have the beſt phyſicians been able to determine it.—Diſſections have only ſhown that the kidneys were in an enlarged and lax ſtate. In one of Dr Home's patients who died, they ſmelled ſour; which ſhowed that the urine peculiar to diabetes came from the kidneys, and was not ſent directly from the inteſtines by a retrograde motion of the lymphatics, as ſome imagine.

Prognoſis. The diabetes is rarely cured, unleſs when taken at the very beginning, which is ſeldom done; and in a confirmed diabetes the prognoſis muſt therefore be unfavourable.

Cure. As there is reaſon to believe that in this affection the morbid ſecretion of urine, which is both preternatural in point of quantity and of quality, ariſes from a morbid diminution of tone in the kidney, the great object in the cure muſt be the reſtoration of due tone to the ſecreting veſſels of the kidney. But as even this diminiſhed tone would not give riſe to the peculiar vitiated ſecretion without a morbid ſenſibility of that organ, it is neceſſarily a ſecond object to remove this morbid ſenſibility. But beſides this, the morbid ſecretion of urine may alſo be counteracted both by a diminution of the determination of fluids to the kidney, and by preventing the occurrence of ſuperfluous water in the general maſs of blood.

On theſe grounds the principal hopes of a cure in this diſtemper are from aſtringent and ſtrengthening medicines. Dr Dobſon's patient was relieved by the following remedies; which, however, were frequently varied, as none of them produced their good effects for any length of time: The bark in ſubſtance, with ſmall doſes of rhubarb; decoction of the bark, with the acid elixir of vitriol; the cold infuſion of the bark, of which he drank from a quart to two quarts daily; Dover's powder; alum-whey; lime-water; antimonials combined with *tinctura Thebaica*. The warm bath was uſed occaſionally when the ſkin was remarkably hot and dry, and the patient complained of reſtleſſneſs and anxiety. The tincture of cantharides was likewiſe tried; but he could never take more than 25 drops for a doſe, without exciting great uneaſineſs in his bowels. The body was kept conſtantly open, either with rhubarb or the infuſion of ſena joined with rhubarb. His common drinks were rice-water, barley-water, lime-water, and milk; lime-water alone; ſage, balm, or mint-tea; ſmall-beer, ſimple water, and water acidulated with the vitriolic acid. In ſeven months, theſe remedies, in whatever manner varied, made no further progreſs in removing the diſeaſe. In Dr Home's patients, all theſe medicines, and many others, were tried without the leaſt good effect; inſomuch that he uſes this remarkable expreſſion: "Thus, theſe two patients have exhauſted all that experience had ever recommended, and almoſt all that theory could ſuggeſt; yet, in both caſes, the diſeaſe has reſiſted all the means of cure uſed." It is remarkable, that though ſeptics were given to both, in ſuch quantity as evidently to produce a putreſcency in the *primæ, viæ*, the urine remained unaltered both in quantity and quality.

But although this diſeaſe be frequently in its nature ſo obſtinate as to reſiſt every mode of cure, yet there can be no doubt that particular remedies have ſucceeded in different caſes. Dr Briſbane relates ſeveral caſes cured by the uſe of tincture of cantharides: and Dr M'Cormick has related ſome in the 9th volume of the Edinburgh Medical Commentaries, which yielded to Dover's powder after a variety of other remedies had been tried in vain.

GENUS LXIII. HYSTERIA. 321
HYSTERICS.

Hyſteria, *Sauv.* gen. 135. *Lin.* 126, *Vog.* 219. *Sag.* gen. 242.
Malum hyſtericum, *Hoffm.* III. 50. *Junck.* 36.
Affectio hyſterica, *Willis* de Morb. Convulſiv. cap. 5. 10. 11. *Sydenham* Diſſ. Epiſt. ad G. Cole, *Whytt* on Nervous Diſorders.

Deſcription. The hyſteria is a convulſive diſeaſe, which comes on at uncertain intervals, ſometimes longer and ſometimes ſhorter, but at no ſtated time. The paroxyſms commonly begin with a languor and debi-

Spaſmi

lity of the whole body; yawning, ſtretching, and reſtleſſneſs. A ſenſe of coldneſs alſo in the extremities, almoſt always precedes, and for the moſt part remains during the whole time of, the paroxyſm. To this ſometimes ſucceeds a ſenſe of heat; and the two ſenſations alternate with each other in different parts of the body. The face is ſometimes fluſhed and ſometimes pale; and ſometimes the paleneſs and fluſhing come alternately. There is a violent pain in the head; the eyes become dim, and pour out tears; there is a rumbling and inflation of the inteſtines; a ſenſation is felt like that of a globe aſcending from the lower part of the abdomen or hypogaſtrium which ſometimes ſeems to roll along the whole alimentary canal. It aſcends to the ſtomach, ſometimes ſuddenly, ſometimes ſlowly; and there produces a ſenſe of inflation and weight, together with anxiety, nauſea, and vomiting. At laſt it comes up to the throat, where it produces a ſenſe of ſuffocation, and difficulty of breathing or ſwallowing. During this time there are the moſt violent pains both in the external and internal parts of the abdomen; the muſcles are convulſed; the umbilicus is drawn inwards; and there are frequently ſuch ſpaſms of the inteſtines, that neither clyſters can be injected, nor even flatus paſs downwards. Sometimes the paroxyſm remits after theſe ſymptoms have continued for a certain time, but more frequently the patients fall into fainting fits; ſometimes they lie without motion, as if they were in a deep ſleep; ſometimes they beat their breaſts violently and continually with their hands, and ſometimes they are ſeized with general covulſions, and the diſeaſe puts on the appearance of an epilepſy. In ſome patients the extremities become cold and ſtiff, and the body has the appearance of one in a catalepſy. Sometimes a moſt violent beating pain takes place in ſome part of the head, as if a nail was driving into it, and all viſible objects ſeem to turn round; grievous pains attack the loins, back, and bladder, and the patients make a ſurpriſing quantity of urine as limpid as water; which laſt is one of the ſureſt ſigns of the diſeaſe. The mind is very much affected as well as the body. Sometimes the patients are tormented with vain fears; ſometimes they will laugh, at other times cry immoderately; and ſometimes their temper becomes ſo peeviſh and fretful, that they cannot enjoy a moment's quiet. The appearances which take place in this affection are indeed ſo much varied, that they can hardly be enumerated: they may, however, with propriety, be divided into hyſteric fits, which very much reſemble thoſe of epilepſy, excepting that they are not attended with an abolition of the internal ſenſes; and hyſteric ſymptoms, ſuch as the *globus hyſtericus*, *clavus hyſtericus*, and the like, which are chiefly known to conſtitute a part of this diſeaſe from being obſerved to alternate with fits.

Cauſes, &c. The general cauſe of hyſteria is thought by the beſt phyſicians to conſiſt in a too great mobility and irritability of the nervous ſyſtem, and of conſequence the diſeaſe may be brought on by whatever debilitates and renders the body irritable. Hence it moſt frequently attacks females of a weak and lax habit of body, though there are ſome inſtances of men alſo attacked by it. It generally comes on between the time of puberty and the age of 35, and makes its attacks during the time of menſtruation more frequently than at any other. It alſo more frequently ſeizes barren women and young widows, than ſuch as are bearing children.

Hyſteria.

Prognoſis. Though the appearance of this diſeaſe be ſo very terrible, it ſeldom proves mortal unleſs by wrong treatment: but notwithſtanding this it is extremely difficult of cure, and rarely admits of any thing elſe than being palliated; for though it ſhould ſeem to be conquered by medicine for a time, it very quickly returns, and that from the ſlighteſt cauſes.

Cure. The ends principally to be aimed at in the cure of this diſeaſe are, in the firſt place, the removal of particular convulſive or ſpaſmodic affections immediately producing various appearances in the diſeaſe, whether under the form of proper hyſteric fits, or merely of what may be called hyſteric ſymptoms; and in the ſecond place, the prevention of the return of ſymptoms after they have been removed, by the employment of proper remedies during thoſe intervals from complaints which patients often have when labouring under this affection.

The moſt powerful remedy hitherto diſcovered in hyſteric caſes is opium, or the tincture of it called *laudanum*. By this commonly the moſt violent paroxyſms are ſtopped, though it be inſufficient to accompliſh a radical cure. In Dr Home's Clinical Experiments we find an inſtance of a cure performed by veneſection, though this remedy has been generally condemned in hyſterical caſes. Aſafœtida ſeems to ſtand next in virtue to opium; though with ſome it diſagrees, and occaſions pains in the ſtomach and vomiting. Æther will alſo frequently remove an hyſteric fit: but its effects are of ſhort duration; and if it do not effect a cure ſoon after its exhibition, no ſervice is to be expected either by perſeverance in the uſe of it or by increaſing the doſe; and with ſome conſtitutions it diſagrees to ſuch a degree as to occaſion convulſions. If the patient be ſeized with a violent fit, ſo that ſhe can ſwallow nothing, which is frequently the caſe, it will be proper to apply ſome ſtrong volatile alkali to her noſe; or if that be not at hand, the vapour of burning feathers is ſometimes very efficacious. In ſome inſtances benefit is derived from the ſudden applicaton of cold water to the face or hands; but ſtill more frequently the application of water in a tepid ſtate, particularly the warm pediluvium, is found to be of very great ſervice in bringing about a favourable termination of different violent hyſteric ſymptoms. A plaſter of galbanum and aſafœtida will alſo prove ſerviceable: but it muſt be remembered, that none of theſe things will prevent the return of the diſeaſe; and therefore a radical cure is to be attempted by exerciſe, the Peruvian bark, chalybeates, mineral waters, and other tonics; but particularly where the ſtate of the patient is ſuch as to be able to bear it, by the uſe of the cold bath, which, where it does not diſagree with the conſtitution, is often of the greateſt ſervice in preventing returns of this affection.

GENUS LXIV. HYDROPHOBIA. 321

The *Dread* of WATER.

Hydrophobia, *Sauv.* gen. 231 *Lin.* 86. *Vog.* 30. *Sag.* gen. 343. *Boerh.* 1138. *Junck.* 124. *Mead* on poiſons. *Deſault* ſur la rage. *Sauv.* diſſ. ſur la rage. *James* on canine madneſs. *Dalby*, Virtues

tues of cinnabar and muſk againſt the bite of a mad dog. *Nugent* on the hydrophobia. *Choiſel*, Nouvelle methode pour le traitement de la rage. *Journal de Medicine*, paſſim. *Medical Obſ. and Inquiries*, vol. iii. art. 34. vol. v. art. 20. 26. and App. *Med. Tranſact.* vol. ii. art. 5. 12. and 15. *Heyſham*, Diſſ. inaug. de rab. canin. Edinb. 1777. *Parry*, Diſſ. inaug. de rab. contagioſ. ſive canin. Edinb. 1778. *Andry*, Recherches ſur la rage, 1778. *Vaughan*, Caſes of hydrophobia, ſecond edit. 1778.

323 Sp. I. *Hydrophobia Rabioſa*, or Hydrophobia conſequent on the *Bite* of a *Mad Animal*.
Hydrophobia vulgaris, *Sauv.* ſp. 1.

It is the opinion of ſome, that Dr Cullen has done wrong in employing the term *hydrophobia* as a generic name, under which canine madneſs is included: and it muſt be allowed, that the dread of water, while it is not univerſal, is alſo a ſymptom occurring only late in the diſeaſe, at leaſt in the greater part of caſes. Perhaps his arrangement would have been leſs exceptionable, if, following Linnæus, he had adopted *rabies* as a generic term, and had diſtinguiſhed this particular ſpecies by the epithet of *canina*, *contagioſa*, or the like. Diſputes, however, about names are in general not very important; and it is ſufficient to obſerve, that the affection now to be treated of is canine madneſs, or that diſeaſe which ariſes from the bite of a mad animal.

Deſcription. This diſeaſe commonly does not make its attack till a conſiderable time after the bite. In ſome few inſtances it has commenced in ſeven or eight days from the accident; but generally the patient continues in health for 20, 30, or 40 days, or even much longer. The bite, if not prevented, will in general be healed long before that time, frequently with the greateſt eaſe; though ſometimes it reſiſts all kinds of healing applications, and forms a running ulcer which diſcharges a quantity of matter for many days. It has been ſaid that the nearer the wounded place is to the ſalivary glands, the ſooner the ſymptoms of hydrophobia appear. The approach of the diſeaſe is known by the cicatrix of the wound becoming high, hard, and elevated, and by a peculiar ſenſe of prickling at the part; pains ſhoot from it towards the throat: ſometimes it is ſurrounded with livid or red ſtreaks, and ſeems to be in a ſtate of inflammation; though frequently there is nothing remarkable to be obſerved about it. The patient becomes melancholy, loves ſolitude, and has ſickneſs at ſtomach. Sometimes the peculiar ſymptom of the diſeaſe, *the dread of water*, comes on all at once. We have an inſtance of one who having taken a vomit of ipecacuanha for the ſickneſs he felt at his ſtomach, was ſeized with the hydrophobia in the time he was drinking the warm water. Sometimes the diſeaſe begins like a common ſore throat; and the ſoreneſs daily encreaſing, the hydrophobic ſymptoms ſhow themſelves like a convulſive ſpaſm of the muſcles of the fauces. In others, the mind ſeems to be primarily affected, and they have a real *dread* of water or any liquid before they try whether they can ſwallow it or not. Dr James, in his Treatiſe on Canine Madneſs, mentions a boy ſent out to fill two bottles with water, who was ſo terrified by the noiſe of the liquid running into them, that he fled into the houſe crying out that he was bewitched. He mentions alſo the caſe of a farmer, who, going to draw ſome ale from a caſk, was terrified to ſuch a degree at its running into the veſſel, that he ran out in a great haſte with the ſpigot in his hand. But in whatever manner this ſymptom comes on, it is certain that the moſt painful ſenſations accompany every attempt to ſwallow liquids. Nay, the bare ſight of water, of a looking-glaſs, of any thing clear or pellucid, will give the utmoſt uneaſineſs, or even throws the patient into convulſions.

With regard to the affection of the mind itſelf in this diſeaſe, it does not appear that the patients are deprived of reaſon. Some have, merely by the dint of reſolution, conquered the dread of water, though they never could conquer the convulſive motions which the contact of liquids occaſioned: while this reſolution has been of no avail; for the convulſions and other ſymptoms increaſing, have almoſt always deſtroyed the unhappy patients.

In this diſeaſe there ſeems to be an extreme ſenſibility and irritability of the nervous ſyſtem. The eyes cannot bear the light, or the ſight of any thing white; the leaſt touch or motion offends them, and they want to be kept as quiet and in as dark a place as poſſible. Some complain of the coldneſs of the air, frequently when it is really warm. Others complain of violent heat; and have a great deſire for cold air, which yet never fails to increaſe the ſymptoms. In all there is a great flow of viſcid ſaliva into the mouth; which is exceedingly troubleſome to the patients as it has the ſame effect upon their fauces that other liquids have. This therefore they perpetually blow off with violence, which in a patient of Dr Fothergill's occaſioned a noiſe not unlike the hollow barking of a dog, and which he conjectures might have given riſe to the common notion that hydrophobous patients bark like dogs. They have an inſatiable thirſt; but are unable to get down any drink, except with the utmoſt difficulty; though ſometimes they can ſwallow bread ſoaked in liquids, ſlices of oranges, or other fruits. There is a pain under the *ſcrobiculus cordis*, as in the tetanus; and the patients mournfully point to that place as the ſeat of the diſeaſe. Dr Vaughan is of opinion that it is this pain, rather than any difficulty in ſwallowing, which diſtreſſes the patient on every attempt to drink. The voice is commonly plaintive and mournful; but Dr Vaughan tells us there is a mixture of fierceneſs and timidity in the countenance which he cannot deſcribe, but by which he could know a hydrophobous perſon without aſking any queſtions.

In this diſtemper, indeed, the ſymptoms are ſo various, that they cannot be enumerated; for we will ſeldom read two caſes of hydrophobia which do not differ very remarkably in this reſpect. Some ſeem to have at times a furious delirium, and an inclination to ſpit at or bite the byſtanders; while others ſhow no ſuch inclinations, but will even ſuffer people to wipe the inſide of their mouths with the corner of a handkerchief in order to clear away the viſcid ſaliva which is ready to ſuffocate them. In ſome male patients there is an involuntary erection of the penis, and emiſſion of the ſemen; and the urine is forced away by the frequent return of the ſpaſms. In a letter from Dr Wolf of Warſaw to Henry Baker, F. R. S. dated Warſaw Sept. 26th, 1767, we have the following melancholy account of the caſes of five perſons who died of the hydrophobia: “None of them quite loſt their right ſenſes; but they were all talking without intermiſſion, praying, lamenting, deſpairing, curſing, ſighing, ſpitting a frothy ſaliva, ſcreeching, ſometimes belching, retching, but rarely vomiting. Every member is convulſed by fits, but moſt violently from the navel up to the breaſt and œſophagus. The fit comes on every quarter of an hour; the fauces are not red, nor the tongue dry. The pulſe is not at all feveriſh; and when the fit is over nearly like a ſound pulſe. The face grows pale, then brown, and during the fit almoſt black; the lips livid; the head is drowſy, and the ears tingling; the urine limpid. At laſt they grow weary; the fits are leſs violent, and ceaſe towards the end; the pulſe becomes, weak, intermittent, and not very quick; they ſweat, and at laſt the whole body becomes cold. They compoſe themſelves quietly as if to get ſleep, and ſo they expire. The blood drawn a few hours before death appears good in every reſpect. A general obſervation was, that the lint and dreſſings of the wounds, even when dry, were always black, and that when the pus was very good in colour and appearance.” In one of Dr Wolf's patients who recovered, the blood ſtunk intolerably as it was drawn from a vein; and one of Mr Vaughan's patients complained of an intolerable fetid ſmell proceeding from the wounded part, though nobody but himſelf could perceive it. In general, the violent convulſions ceaſe a ſhort time before death; and even the hydrophobia goes off, ſo that the patients can drink freely. But this does not always happen; for Mr Vaughan mentions the caſe of a patient, in whom, “when he had in appearance ceaſed to breathe, the ſpaſmus cynicus was obſervable, with an odd convulſive motion in the muſcles of the face; and the ſtrange contrariety which took place in the action of theſe produced the moſt horrid aſſemblage of features that can well be conceived. Of this patient alſo it was remarkable, that in the laſt hours of his life he ceaſed to call for drink, which had been his conſtant requeſt; but was perpetually aſking for ſomething to eat.”

The hydrophobia ſeems to be a ſymptom peculiar to the human race; for the mad animals which communicate the infection, do not ſeem to have any dread of water. Dr Wolf, in the letter above quoted, ſays in general, that cattle bit at the ſame time and by the ſame animal (a mad wolf) which bit the perſons whoſe caſes he related, died nearly with the ſame frightful raging as the men; but ſays nothing of their having any hydrophobia: nay, Dr James and ſome others aſſert, that the hydrophobia is not always an attendant on rabies canina in the human race; and indeed it is certain that the diſeaſe has proved mortal after this terrible ſymptom has been removed. With regard to the ſymptoms of madneſs in dogs, they are very equivocal; and thoſe particularly enumerated by ſome authors, are only ſuch as might be expected in dogs much heated or agitated by being violently purſued and ſtruck. One ſymptom indeed, if it could be depended upon, would determine the matter; namely, that all other dogs avoid and run away from one that is mad; and even large dogs will not attack one of the ſmalleſt ſize who is infected with this diſeaſe. Upon this ſuppoſition they point out a method of diſcovering whether a dog who hath been killed was really mad or not; namely, by rubbing a piece of meat along the inſide of his mouth, and then offering it to a ſound dog. If the latter eats it, it is a ſign the dog was not mad; but if the other rejects it with a kind of howling noiſe, it is certain that he was. Dr James tell us, that among dogs the diſeaſe is infectious by ſtaying in the ſame place; and that after a kennel has been once infected, the dogs put into it will be for a conſiderable time afterwards in danger of going mad alſo. A remedy for this, he ſays, is, to keep geeſe for ſome time in the kennel. He rejects as falſe the opinion that dogs when going mad will not bark; though he owns that there is a very conſiderable change in their bark, which becomes hoarſe and hollow.

Cauſes, &c. In no diſeaſe whatever are we more at a loſs to diſcover the cauſes than in the hydrophobia. In dogs, foxes, and wolves, it ſeems to come on ſpontaneouſly; though this is conteſted by ſome authors. It is ſaid, that the cauſes commonly aſſigned, viz. heat, feeding upon putrid fleſh, want of water, &c. are not ſufficient for producing the diſtemper. It does not appear that madneſs is more frequent among dogs in the warm than in the cold climates; nay, in the iſland of Antigua, where the climate is very hot, and the water very ſcarce, this diſtemper has never, it is ſaid, been obſerved. As to putrid aliment, it ſeems natural for dogs to prefer this to any other, and they have been known to ſubſiſt upon it for a long time without any detriment. For theſe reaſons, they think the diſeaſe ariſes from a ſpecific contagion, like the ſmall-pox and meaſles among the human race, which, being once produced by cauſes unknown, continues to be propagated by the intercourſe which dogs have with each other, as the diſeaſes juſt mentioned continue to be propagated among the human race by means of the intercourſe which they have with one another.

With regard to the immediate cauſe among mankind, there is not the leaſt doubt that the hydrophobia is occaſioned by the ſaliva of the mad animal being mixed with the blood. It does not appear that this can operate through the cuticula; but, when that is rubbed off, the ſmalleſt quantity is ſufficient to communicate the diſeaſe, and a ſlight ſcratch with the teeth of a mad animal has been found as pernicious as a large wound. It is certain alſo, that the infection has been communicated by the bites of dogs, cats, wolves, foxes, weaſels, ſwine, and even cocks and hens, when in a ſtate of madneſs. But it does not appear that the diſtemper is communicable from one hydrophobous perſon to another, by means of the bite, or any other way. Dr Vaughan inoculated a dog with the ſaliva of a hydrophobous child, but the animal continued free from diſeaſe for two months; and though the doctor promiſed to inform the public if it ſhould happen to occur afterwards, nothing has hitherto appeared on that ſubject. A nurſe alſo frequently kiſſed the child during this time of his diſorder, but no bad conſequences enſued.

When we attempt to inveſtigate the nature of the cauſe of the hydrophobia by diſſections, our inquiries are commonly diſappointed. In two bodies opened by Dr Vaughan, there was not the leaſt morbid appearance; in the very fauces, where we might have expected that the diſeaſe would have ſhown itſelf moſt evidently, there was not the leaſt appearance even of inflammation. The ſtomach, inteſtines, diaphragm, œſophagus, &c. were all in a natural ſtate: neither do we find in authors of credit any certain accounts of morbid appearances in the bodies of hydrophobous perſons after death. Dr Vaughan therefore concludes, that the poiſon acts upon the nervous ſyſtem; and is ſo wholly confined to it, that it may be doubted whether the qualities of the blood are altered by it or not; and that it acts upon the nerves by impairing and diſturbing their functions to ſuch a degree as ſpeedily to end in a total extinction of the vital principle. As to the difficulty in ſwallowing generally believed to accompany dread of the water, he treats it as a miſrepreſentation, as well as that the œſophagus with the muſcles ſubſervient to deglutition are eſpecially concerned in this diſeaſe. The principal foundation of the evil, he thinks, reſts on a morbid ſenſibility both of the external and internal fauces. For the ſight of a liquid, or the application of any ſubſtance to the internal fauces, but more eſpecially of a fluid, inſtantly excites the moſt painful feelings. Nay, the ſame ſymptoms are produced by touching the external fauces with a fluid, or by the contact of cold air with theſe parts; and nearly in as great a degree. But a ſolid or a fluid ſubſtance being conveyed into the œſophagus, the tranſit into the ſtomach is accompliſhed with little or no impediment; ſo that in fact the difficulty is ſurmounted before the patient be engaged in the action of ſwallowing. Nor is the excruciating pain, which never fails to be the companion of every attempt to drink, felt in the *fauces* and *throat*: it is, he ſays, at the *ſcrobiculus cordis*; to which the ſufferer applies his hand. From this laſt circumſtance, therefore, from the preſence of the *riſus ſardonius*, from the muſcles of the abdomen being forcibly contracted, and from the ſenſe of ſuffocation which ſeems to threaten the patient with immediate death, Dr Vaughan has been led to think that in the hydrophobia a new ſympathy was eſtabliſhed between the fauces, the diaphragm, and the abdominal muſcles.

Prognoſis. When a perſon is bit, the prognoſis with regard to the enſuing hydrophobia is very uncertain. All thoſe who are bit do not fall into the diſeaſe; nay, Dr Vaughan relates that out of 30 bit by a mad dog, only one was ſeized with the hydrophobia. During the interval betwixt the bite and the time the diſeaſe comes on, there are no ſymptoms by which we can judge whether it will appear or not. When once it hath made its appearance, the prognoſis is exceedingly fatal.

Prevention and Cure. It has been generally allowed by practitioners, that though the hydrophobia may be prevented, yet it can ſeldom if ever be cured after it has made its appearance. The moſt eſſential part of the treatment therefore depends on the proper uſe of means of prevention. The great objects to be aimed at in prevention, are, in the firſt place, the complete removal of the contagious matter as ſoon as poſſible; or, ſecondly, means of deſtroying it at the part, where there is even the ſlighteſt reaſon to believe that it has not been completely removed. Of all the means of removal, the complete cutting out the part to which the tooth has been applied, is unqueſtionably the moſt to be depended upon. This practice, therefore, ſhould be had recourſe to as ſoon as poſſible. The ſooner it can be accompliſhed, the better. But as it has been obſerved, that a peculiar ſenſation at the part affected always precedes the acceſſion of the diſeaſe, even when it takes place at a late period after the bite, there is good ground for believing that removal of the part may be of advantage even after a conſiderable interval. But beſides removal of the contagious matter, by cutting away the part to which it is attached, this ſhould alſo be done by careful and long continued waſhing. This may be done, in moſt inſtances, before a proper opportunity can be had of having recourſe to the knife. Cold water ſhould particularly be poured upon the wound from a conſiderable height, that the matter may be waſhed away with ſome force. Even after removal by the knife, careful waſhing is ſtill a neceſſary and proper precaution And after both theſe, to prevent as far as can be, the poſſibility of any contagious matter lurking about the wounded part, it ſhould not be allowed to heal, but a diſcharge of matter ſhould be ſupported for the ſpace of ſeveral weeks, by ointment with cantharides, or ſimilar applications. By theſe means there is at leaſt the beſt chance of removing the matter at a ſufficiently early period. And this mode of prevention ſeems to be of more conſequence than all others put together which have hitherto been diſcovered. But beſides removal, prevention may alſo be obtained by the deſtruction of the contagious matter at the part; and where there is the leaſt reaſon to think that a complete removal has not been obtained, theſe ſhould always be had recourſe to. With this intention the actual cautery and burning with gun-powder have been employed. And the action of fire is probably one of the moſt powerful agents that can be uſed for this purpoſe. But recourſe has alſo been had to waſhing both with acids and with alkalies. Of the former kind, vinegar has been chiefly uſed, but more may probably be expected from the latter; and particularly from the cauſtic alkali, ſo far diluted that it can be applied with ſafety: for from its influence as a ſolvent of animal mucus, it gives a better chance of a complete removal of the matter, independent of any influence in changing its nature. It has been thought alſo, that oil applied to the part may be of ſervice. But if recourſe be had to it, more active meaſures ſhould at leaſt be previouſly employed; and even then, ſome are of opinion that it is of advantage to increaſe the activity of the unctuous matter by combining it with mercury.

On theſe grounds, and by theſe means, we are inclined to think that the action of this contagion on the ſyſtem, after it has been applied by the bite of a rabid animal, may be moſt effectually prevented. But after this action has once taken place, no remedy has yet been diſcovered on which much dependence can be put. A very great variety of articles indeed have at different periods been held forth as infallible, both in the prevention and cure of this affection; but their reputation has, perhaps, univerſally been founded on their being given to people, who, though really

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bit by a mad dog, were yet not infected with the contagion. And this happily, either from the tooth being cleaned in making the bite, or not being covered with contagious matter, is by no means an unfrequent occurrence. Mankind, however, even from the earlieſt ages, have never been without ſome boaſted ſpecific, which has been held forth as an infallible remedy for this affection till fatal experience demonſtrated the contrary. Dr Boerhaave has given a pretty full catalogue of thoſe ſpecifics from the days of Galen to his own time; and concludes, that no dependence is to be put in any of them. It is now, therefore, altogether unneceſſary to take notice of burnt crabs, the hyæna's ſkin, mithridate with tin, liver of the rabid animal, or a variety of other pretended remedies for this diſeaſe, proved by experience to be totally inefficacious. But although no greater confidence is perhaps to be put on ſpecifics of modern date, it will be proper that theſe ſhould be mentioned.

Bathing in cold water, eſpecially in the ſea, and drinking ſea-water for a certain time, have been preſcribed, and by ſome accounted a certain preventive. When this was known to fail, a long courſe of antiphlogiſtic regimen, violent ſubmerſion in water, even to danger of drowning, and keeping the wounded place open with cauteries, were recommended.—To this extreme ſeverity Dr Mead objected; and in his treatiſe on this ſubject endeavours to ſhow, that in all ages the greateſt ſucceſs has been reaped from diuretics, for which reaſon he propoſes the following powder: "Take aſh-coloured ground-liverwort, half an ounce; black-pepper, two drachms: reduce them ſeparately to powder, then mix them together." This powder was firſt publiſhed in the Philoſophical Tranſactions, by Mr Dampier, in whoſe family it had been kept as a ſecret for many years. But this medicine, which was inſerted in former editions of the London and Edinburgh pharmacopœias, under the name of *Pulvis Antilyſſus*, has long loſt its credit.

There is a famous Eaſt-India medicine, compoſed of 24 grains of native and as much factitious cinnabar, made into a powder with 16 grains of muſk. This is called the *Tonquin* medicine, and muſt be taken in a tea-cupful of arrac or brandy; and is ſaid to ſecure the patient for 30 days, at the expiration of which it is to be repeated; but if he has any ſymptoms of the diſeaſe, it muſt be repeated in three hours, which is ſaid to be ſufficient for a cure. The firſt doſe is to be taken as ſoon after the bite as poſſible.

Another celebrated remedy is Palmarius's powder, compoſed of the leaves of rue, vervain, ſage, polypody, wormwood, mint, mugwort, balm, betony, St John's-wort, and leſſer centaury. Theſe herbs muſt be gathered in their prime, dried ſeparately in the ſhade, and then powdered. The doſe is a drachm, or a drachm and an half, taken every day.

A remedy which might promiſe to be more efficacious than any of thoſe hitherto mentioned is mercury. This hath been recommended in frictions, and to be taken inwardly in the form of calomel and turbith-mineral, in order if poſſible to raiſe a ſlight ſalivation, on which the efficacy was thought to depend. Beſides this, veneſection, opium, the bark, and camphor, have been tried in very large quantities; the warm bath; and, in ſhort, every thing which human invention could ſuggeſt; but with what ſucceſs, can beſt be judged from the following well authenticated caſes.

Hydrophobia.

In the beginning of December 1728, a young gentleman, aged 17, was bit by a dog in the middle-finger of the right-hand about the middle of the nail. In the beginning of January 1729, he complained of pain in that finger reaching along the back of the hand to the elbow. In the night between the ſixth and ſeventh days of that month he became hot and reſtleſs: emollient and anodyne fomentations were applied; but the pain became very ſharp, and the hydrophobia came on in the night-time. He was blooded; but became worſe every hour, and at laſt quite furious and outrageous. The bandage was thrown off from his arm, and he loſt about 20 ounces of blood beſides what had formerly been taken from him. This, however, made no abatement of the ſymptoms, and he died the ſame night.

In 1753, a woman, ſeized with the hydrophobia in conſequence of the bite of a dog ſuppoſed to be mad, was treated in the following manner by Dr Nugent. Firſt ſhe was blooded to about 15 ounces; ſhe took 15 grains of muſk in powder, and alongſt with it a pill of two grains of pure opium, every three hours. A plaſter of galbanum, with half an ounce of pure opium, was laid to her neck and throat. She began to take theſe medicines on a Saturday morning, an hour or two after the dread of water had commenced. In the evening ſhe was a little eaſier at intervals. The muſk and opium pill were continued as before, and the hand that was bit was ordered to be chafed with warm ſalad oil ſeveral times a day. Only two papers of powder and two pills were taken in the night, for the laſt made her ſick and vomit. She had little or no ſleep, but lay pretty quiet.—On Sunday, 20 ounces of blood were taken away, and a clyſter with antimonial wine injected: the pills and powders were continued as before. On Sunday evening ſhe could ſwallow liquids a little better, and ſhe lay quiet moſt of the night. On Monday her ſwallowing was greatly better. The muſk and opium were continued, and twelve ounces more of blood were taken from her; the plaſter was renewed with only two drachms of opium, and the oil was uſed as before. At night ſhe was better; her hand eaſy; and by a continuance of theſe remedies ſhe recovered.—This was the caſe which chiefly brought opium into reputation.

The following caſes publiſhed by M. Deſſault, a Frenchman, firſt brought mercury into reputation.—Four men were bitten by the ſame wolf, on the ſame day, at the ſame hour. They were dipped in ſalt-water, and came back perſuaded that they had nothing to fear. Some days after, one of them felt a numbed pain about his ſcars, while the ſcars themſelves grew hard and roſe like an embroidery: he was ſoon after ſeized with the uſual ſymptoms, as was alſo another. The ſon of the former likewiſe began to feel a pain about the cicatrices, and a ſwelling with hardneſs; as did alſo the fourth. They were ordered to rub a drachm and a half of the mercurial or blue ointment upon the cicatrices and about the whole arm. This was repeated three days ſucceſſively, and then every other day: after the fifth friction, he allowed an interval of two days. Beſides this, they took every day a drachm and an half of Palmarius's powder. After the third friction the cicatices grew flat and ſoft, the pain went off, their courage returned, and their mind reſumed its former tranquillity.

But how far mercury, or indeed any thing elſe, is from being a *ſpecific* in the hydrophobia, will appear from the following account of Dr Wolf's patients.—In the middle of April 1767, ſeventeen people, and a great number of cattle were bitten in the neighbourhood of Warſaw by a mad wolf. One of theſe, an officer, was brought into the city that ſame day, and had the beſt advice of the ſurgeons and phyſicians in that place; beſides which, he took the bark very copiouſly with camphor. He continued well till the ſeventh week, when he became hydrophobous, and died.

Eleven of the others applied to Dr Wolf on the ninth day. Their wounds were all deeply ſcarified; diligently waſhed and fomented with vinegar, ſalt, and theriaca; and kept open till the 80th day, in thoſe who lived ſo long. Every two weeks they were blooded largely, and were purged every week with ſalts and jalap. Their diet was moſtly vegetable, and their drink whey and water. They all eat as much as could be got of the herbs *matriſylva* and *anagallis flore puniceo;* and they all took often the *pulvis Palmarii.* The *muſcus cinereus terreſtris* could not be got, or it would alſo have been preſcribed. Beſides the general treatment, two were rubbed daily with a drachm of mercurial ointment, and had their purges with calomel. Two took every day four ounces of vinegar, three drachms tincture of poppies, and half an ounce of *rob ſambuci* every night. One took every day 16 grains of camphor, with four ſcruples of ſaltpetre, and at night half an ounce of *rob ſambuci.*—Two took 24 grains of muſk, with 50 grains of cinnabar. Other two took from 40 to 60 drops of ſpirit of ſal ammoniac, prepared with quick-lime; and the laſt took a ſcruple of cryſtallized ſalt of tartar made by the mixture of a little ſpirit of ſal ammoniac with a ſolution of that ſalt.

One of the firſt who uſed the mercurial ointment was ſeized with the hydrophobia on the 22d day, immediately after being well purged with calomel. He was blooded copiouſly, plunged abundantly in cold water, and had ſeveral clyſters adminiſtered, without effect. Two pounds of oil, and as much of drink, were poured down by force; alſo a drachm of ſalt of tartar and half a drachm of muſk were given in three doſes. He then began to drink freely, but died the third day. His companion then left off the uſe of mercury, and took 80 drops a-day of Dippel's animal oil, till he had taken ſix drachms of it; after which he went on with 100 drops daily of ſpirit of ſal ammoniac made with alkali.

One of thoſe who took the vinegar fell ſick the 33d day. He was immediately blooded, and vomited with ipecacuanha. This man was too ſtrong to make experiments on by force: he refuſed every thing, and died the third day. His companion, on old man, began to be ſeized in the ſame manner: he was purged with ſalts, took the *morſulæ balſami Peruviani,* and drank lemonade. He recovered, and uſed afterwards 100 drops of ſpirit of ſal ammoniac daily. This was the patient formerly mentioned, whoſe blood had the fetid ſmell.

The man who uſed the camphor fell ſick the 33d day. He was thrice copiouſly blooded, was plunged forcibly into the coldeſt water for the ſpace of two hours, and was nearly drowned. He was clyſtered with effect. He himſelf forced down with incredible averſion and labour, a great quantity of drink; by which he vomited more than 50 times abundance of frothy ſlime. He took ſeveral ounces of oil, and ſeveral boluſes of caſtor and opium, of each four grains, without effect; and died the fourth day.

A girl who uſed the muſk with cinnabar, fell ill the 62d day, and died the third day after. No farther attempt was made to ſave her life, ſhe being then at a diſtance. Her companion, a pregnant woman, then left off the muſk, and took in its ſtead ſpirit of ſal ammoniac.

A woman who had taken nothing fell ill on the 40th day. She ſuffered terribly in the night, but leſs in the day time. Beſides the uſual ſymptoms, ſhe had great pain and ſwelling in her belly. In the ſpace of two days ſhe drank about two bottles of brandy, but would taſte no other liquor. The Doctor ordered her to mix an equal quantity of oil with her brandy, and to take every day two boluſes of caſtor and opium.—She recovered: and at laſt took two doſes of turbith-mineral, by which ſhe was vomited and purged.

After the 80th day, all the ſurviving people took thrice the turbith-mineral, except the pregnant woman; and they afterwards continued their alkaline medicines to the 100th day.

On theſe caſes Dr Wolf makes the following obſervations.—"Thus we ſee, that the bark, the mercury, the acids, the muſk, the feeding on the moſt famous herbs, the ſweating, the *cura antiphlogiſtica,* are no ſpecifics. I don't know what to ſay to the alkalies: the danger is not yet over; and there are ſtill four people who uſed nothing, in as good health as my patients."

The following caſe by Dr Raymond of Marſeilles, ſhows the inefficacy of mercury even as a *preventive.*—On the 19th of July 1765, Mr Boyer, aged 25, of a bloated cachectic habit, was bit by a mad dog in the inferior part of the leg: the wound extended half way round, bled freely, and was like a great ſcratch. The patient's legs had been ſwelled for a conſiderable time before the accident; and there were alſo two ulcers in the other leg. Some hours after the accident, the actual cautery was applied to the wound. The Doctor was not preſent at this operation; but the part around the bite was rubbed with mercurial ointment immediately after, and the eſchar was dreſſed with the ſame ointment. The eſchar was ſeparated on the firſt day, but the dreſſing was continued till the wound was cicatriſed. The ſecond day a bolus of four grains of turbith and eight grains of camphor was exhibited. This procured a conſiderable evacuation both by vomit and ſtool, and a ſpitting alſo came on. The third day the bitten leg was rubbed with mercurial ointment: in the ſpace of a month the frictions were repeated five times on both legs, three drachms of mercurial ointment being uſed in each friction. During the ſame time the bolus was five times repeated; and this treatment kept up a ſlight ſalivation to the 40th day. The evening of the third day he took the *Tonquin medicine,* called alſo *Sir George Cobb's powder,* in a bolus; which vomited him briſkly. This powder was repeated ſeven or eight times in the month, generally with the ſame effect. During the firſt ſeven or eight days he got four times, in the morning, a drachm of the *anagallis flore puniceo*, freſh gathered and powdered. The 41ſt day, the turbith bolus was preſcribed for the ſeventh time; he was bathed in the ſea, and continued the bathing for two days more. On the 74th he was ſeized with the diſtemper; and died on the 76th ſeemingly ſuffocated or ſtrangled, his mouth covered with ſlaver, and his face bloated. He loſt his ſenſes not above half a quarter of an hour before his death. The pulſe was quiet the whole time. The Doctor ſays he has reaſon to ſuſpect the wound was not well cauterized,

Another inſtance is mentioned by the ſame author, of a pregnant woman bit by the ſame dog and on the ſame day with Mr Boyer, who was never ſeized with the diſtemper. She was treated in much the ſame manner with him, and ſalivated a little more. But ſhe was bit through a ſhamoy leather ſhoe, which muſt neceſſarily have cleaned the animal's teeth of the poiſonous ſaliva before they reached her ſkin, and to this we are naturally led to aſcribe her ſafety. One of Dr Wolf's patients alſo was a pregnant woman, and was not ſeized with the diſtemper. Perhaps women in a ſtate of pregnancy may be leſs liable to this diſtemper than others; but it is more probable that the contagion was not communicated.

The ſame author tells us, "there are many examples of the inefficacy of mercurial frictions. A ſurgeon of Marſeilles treated a girl about 12 years of age bit by a mad dog, with mercurial frictions; applying them as in the *lues venerea:* yet ſhe died of the hydrophobia on the 55th day. Her wound was not cauterized."

In the following caſe all the moſt powerful remedies were tried.—In the afternoon of the 29th of Aug. 1778, Dr Vaughan was called to a boy of eight years of age labouring under a hydrophobia. He had been bit on the wriſt by a cat about a month before; of which the marks remained, but without any ulcer, or even the ſmalleſt appearance of inflammation. About the middle of the day before Dr Vaughan ſaw him, he began to complain of a pain in the part bitten, which aſcended up the arm, and affected the temple on that ſide; ſoon after which he ſwallowed liquids with reluctance and difficulty. He was put into the warm bath for three quarters of an hour, during which time he was eaſier: he had a clyſter of five ounces of freſh broth, and 30 drops of laudanum, injected immediately after his coming out of it; a liniment conſiſting of three drachms of ſtrong mercurial ointment, with the ſame quantity of oil of amber, was rubbed upon the ſhoulders and back; two pills of a grain of flowers of zinc, and half a grain of *cuprum ammoniacum*, were taken every three or four hours; and a medicated atmoſphere was prepared for him, by burning gum ammoniac in his room. As theſe remedies were not attended with any good effect, each doſe of pills was ordered to contain two grains of *cuprum ammoniacum*, the ſame quantity of opium, three grains of flowers of zinc, and ten grains of aſafœtida; whilſt a ſolution of that fetid gum, with a drachm of laudanum was adminiſtered as a clyſter. Theſe pills, though repeated every four hours, afforded not the ſmalleſt relief, nor did they ſhow the leaſt action on the frame. At laſt the Doctor reſolved to put in practice the deſperate remedy mentioned by Van Helmont, of throwing the patient into cold water and keeping him there till he is almoſt drowned. With this view a large tub of cold water, well ſaturated with common ſalt, was prepared, into which the poor boy was plunged over head and ears, and there held until he ceaſed to ſtruggle. He was then taken out again, and the ſame operation repeated until he became ſo quiet that the Doctor was under apprehenſions that a total extinction of life would take place, He was then wrapped up in a blanket and put to bed, and he remained more quiet than he had formerly been; but all his former reſtleſsneſs ſoon returned, his pulſe ſunk, and he died about two'clock in the morning.

Another celebrated antidote againſt the poiſon of a mad dog hath been known for ſome years by the name of the *Ormſkirk medicine*. The true compoſition of this is kept a ſecret by the proprietors: however, it has been analyſed, and the following compoſition publiſhed by Dr Heyſham as perfectly ſimilar to it in all reſpects.

"Take half an ounce of chalk, three drachms of Armenian bole, ten grains of alum, one drachm of elecampane in powder; mix them altogether, and add ſix drops of oil of aniſe."

They muſt certainly be very credulous who can put confidence in ſuch an inſignificant medicine as a preſervative againſt the hydrophobia: however, there is a poſſibility that there may be ſome unknown ingredient in the genuine powder; for it is difficult to analyſe powders after the ingredients are thoroughly mixed together. The efficacy of the medicine therefore muſt depend on the virtues of that unknown ingredient, if any ſuch there be. The following caſes, however, too well determine that it is not *infallible*, as was at firſt pretended. In all probability, as well as many others, its reputation alſo is ſolely reſted on its being exhibited in many caſes where no contagion was communicated to the perſon bit, and while of courſe no diſeaſe could take place.

On the 14th of February 1774, Mr Bellamy of Holborn, aged 40, was bit by a cat, which was killed the ſame morning. The following day he took the celebrated Ormſkirk medicine, ſold by Hill and Berry in Hill-Sreet, Berkeley-Square, and conformed in every reſpect to the directions given by the vender. A ſervant-maid who was bitten in the leg before her maſter was bitten, likewiſe took the ſame remedy. About the middle of April Mr Bellamy complained of a pain in his right knee, which he ſuppoſed to be rheumatic, and which continued and increaſed till the 7th of June, when he got ſome pills of calomel, ipecacuanha, and *pil. ſapon.* from an apothecary, which huxham's tincture of the bark in ſmall doſes. In ſix days more he had a titillation in the urethra, a contraction of the ſcrotum and penis to a degree of pain, and an emiſſion of ſemen after making water, to which he had frequent calls. The medicines were diſcontinued; and on the 16th of that month the hydrophobia came on, and Dr Fothergill was called. Six ounces of blood were taken from his arm, and a bolus of a ſcruple of native cinnabar and half a ſcruple of muſk was given every four hours. The diſtemper manifeſtly increaſed through the day. In the evening a clyſter was injected, and ſeveral times repeated during the night; he had been put into the warm bath, and two drachms of ſtrong mercurial ointment rubbed into his legs and thighs by

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himſelf. He was greatly relieved by the warm bath while he continued in it, but the ſymptoms returned with increaſed violence in the night. The next day, being greatly worſe, he was blooded to as great a quantity as he could bear, had the warm bath and clyſters repeated, and half an ounce of mercurial ointment rubbed into his thighs and legs, Pills of opium were preſcribed, but he did not take them. He died the ſame night, at half an hour after 12. This patient was a man of great reſolution, and could in part conquer his averſion at water. He ſeemed to have totally forgot the accident of the bite: and caſually ſaid, that he thought this diſorder reſembled the hydrophobia, without ſuppoſing that he was afflicted with that diſtemper at the time.—The bite on the girl's leg refuſed to heal, baffled the art of a young ſurgeon who attempted to cure it, and continued a running ulcer for a long time. She did not fall into the hyprophobia. Hence Dr Fothergill thinks it probable, that keeping the wounds made by the teeth of mad animals open for a long time, would probably be of ſervice as a preventive; but in ſome of Dr Wolf's patients, theſe artificial drains appear not to have been attended with ſucceſs.

On the 16th of November 1773, Thomas Nourſe, a ſtrong healthy boy of 14, was admitted into the Leiceſter infirmary; having been that day month bitten by a mad fox-hound. The wound was a large lacerated one on the cheek, and bled very freely on being inflicted. The day after he was bit he went to the ſea, where he was dipped with all the ſeverity uſually practiſed under ſo diſagreeable an operation. The *Ormſkirk medicine* was alſo adminiſtered with all due care. It was bought of the perſon in Leiceſter who is deputed by the proprietor to ſell it for him. A common adheſive plaſter was applied to the part after ſea-bathing; and in the courſe of a month, without any further trouble, the wound was healed; excepting a ſmall portion, ſomewhat more than an inch in length, and in breadth about one-tenth. This yielded no diſcharge, and was quite in a cicatrizing ſtate. Five days before his admiſſion into the infirmary, he began to complain of a tightneſs over his temples, and a pain in his head: in two days the hydrophobia began to appear; and at its commencement he complained of a *boiling heat* in his ſtomach, which was continually aſcending to the fauces. The diſeaſe was pretty ſtrong when he came to the infirmary. He got a bolus of a ſcruple of muſk with two grains of opium; then a compoſition of 15 grains of muſk, one of turbith mineral, and five grains of opium, was directed to be taken every third hour; an ounce of the ſtronger mercurial ointment was to be rubbed on the cervical vertebræ and ſhoulders, and an embrocation of two ounces of laudanum, and half an ounce of *acetum ſaturninum*, was directed to be applied to the throat. But by this laſt he was thrown into convulſions, and the ſame effect followed though his eyes were firſt covered with a napkin. The embrocation was therefore changed for a plaſter of three drachms of powdered camphor, half an ounce of opium, and ſix drachms *confectio Damocritis*. By theſe medicines the diſeaſe ſeemed to be ſomewhat ſuſpended, but the ſymptoms returned with violence in the evening. This medicine was repeated at ſeven; and at eight five grains of opium were exhibited without muſk or turbith. At nine, another ounce of mercurial ointment was rubbed upon the ſhoulders, and half an ounce of laudanum with ſix ounces of mutton-broth was injected into the inteſtines, but to no purpoſe. A larger doſe of opium was then given, but with as little effect as the former, and he died the ſame night.

In the month of September 1774, a farmer, aged 25, was bit by a mad dog, whoſe teeth made a ſlight wound in the fore-finger of the left hand. He was dipped, as uſual, in the ſea; and drank the ſea-water for ſome time on the ſpot, which operated briſkly as a purge. He continued well till the 6th of June following, when he firſt felt a pain in that hand and arm; for which he bathed in a river that evening, ſuppoſing that it had been a rheumatic complaint. The next day he was ſick; and in the evening was ſeized with a violent vomiting, which continued all that night and till the middle of the next day, when it was ſucceeded by the hydrophobia. He was treated with the warm bath; had a purgative clyſter injected; and as ſoon as it had operated, a ſecond was given, conſiſting of four ounces of oil, and half an ounce of laudanum: half an ounce of ſtrong mercurial ointment was rubbed on the fauces, and the part was afterwards covered with the *cataplaſma e cymino*, to which was added an ounce of opium. An embrocation was applied to the region of the ſtomach with continued friction, conſiſting of half an ounce of ſpirit of ſal ammoniac, ten drachms oil olive, ſix drachms of oil of amber, and ten drachms of laudanum. Two ounces of ſtrong mercurial ointment were rubbed upon the ſhoulders and back; and as a further means of kindling a ptyaliſm ſpeedily, he received the ſmoke of cinnabar into the mouth by throwing a drachm of that ſubſtance now and then upon a hot iron: he was alſo directed to take every four hours a bolus of 15 grains of muſk, three grains of turbith mineral, and four grains of opium. He was eaſier while in the warm bath, and during the application of the ointment; but died the ſame night about two o'clock.

Many other inſtances might be adduced of the inefficacy of this pretended ſpecific: the danger of acquieſcing in which, will, it is hoped, create a due degree of caution in thoſe to whom they who are ſo unfortunate as to be bit by a mad animal may commit themſelves. Another remedy may alſo be mentioned as having had the reputation of being ſometimes ſucceſsful in this diſeaſe; which is chiefly employed in different parts of India, particularly in the territory of Tanjore. The medicine to which we now allude contains indeed ſeveral articles which are altogether unknown in our materia medica: but it contains at leaſt one very powerful ſubſtance well known to us, viz. arſenic. This medicine, known by the name of the Snake Pills, as being principally employed againſt the bite of the moſt venomous ſnakes, is directed to be prepared in the following manner:

Take white arſenic, of the roots of nelli navi, of nevi viſham, of the kernels of the ner valum, of pepper, of quickſilver, each an equal quantity. The quickſilver is to be rubbed with the juice of the wild cotton till the globules are perfectly extinguiſhed.

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The arſenic being firſt levigated, the other ingredients, reduced to a powder, are then to be added, and the whole beat together with the juice of the wild cotton to a conſiſtence fit to be divided into pills.

Though theſe pills are principally uſed againſt the bite of the cobra de capello, yet they are ſaid alſo to be ſucceſsful in the cure of other venomous bites; and, for the prevention of rabies canina, one is taken every morning for ſome length of time. Of this remedy European practitioners have, we believe, as yet no experience; and if, in the accounts tranſmitted by Eaſt India practitioners, it cannot be ſaid that we have authentic evidence of its want of ſucceſs, it can as little be pretended that there is indubitable evidence of its efficacy in any inſtance; and it is by no means improbable, that it will be found equally inefficacious with others at one time conſidered as infallible.

Of the great variety of remedies which have had their day of reputation, there is not one which has not poſſeſſed the credit, ſome time or other, of preventing the noxious effects ariſing from the bite of a mad dog. A more adequate experience has with all of them diſcovered the deception. It was above obſerved, that the hydrophobia is by no means the infallible conſequence of being bit by a mad animal; and that of between 20 and 30 perſons who were bit by the dog which gave the fatal wound to one of Dr Vaughan's patients, not one felt the leaſt ill effect but himſelf. "In the above number (ſays the Doctor) were ſome who took the Ormſkirk Medicine; others went to the ſalt-water; and a part of them uſed no remedy, who yet fared equally well with the moſt attentive to their injury. The ſame thing has often happened before; and much merit, I doubt not, has been attributed to the medicine taken, from that celebrated one of *Sir George Cobb* down to the *infallible* one which my good *Lady Bountiful*'s receipt book furniſhes."

From all that has been ſaid, the reader will judge how far the hydrophobia is capable of being ſubdued by any of the medicinal powers which have yet been tried. Some eminent phyſicians aſſert that it is totally incurable; and allege that the inſtances recorded by different authors of its cure have not been the genuine kind, but that which comes on ſpontaneouſly, and which is by no means ſo dangerous. Indeed two of Dr Wolf's patients recovered, where the diſeaſe ſeems to have been perfectly genuine: but in theſe the poiſon ſeemed to vent itſelf partly on ſome other place beſides the nervous ſyſtem. In one the blood was evidently infected, as it had an abominable fœtor; and the other had a violent pain and ſwelling in the belly. In all the others, it ſeemed to have attacked only the nervous ſyſtem; which perhaps has not the ſame ability to throw off any offending matter as the vaſcular ſyſtem.

There is, however, a poſſibility that the prodigious affections of the nerves may ariſe only from a vitiated ſtate of the gaſtric juices; for it is well known, that the moſt terrible convulſions, nay the hydrophobia, itſelf, will ariſe from an affection of the ſtomach, without any bite of a mad animal. This ſeems to be ſomewhat confirmed from one of Dr Wolf's patients, who, though he vomited more than 50 times, yet ſtill threw up a frothy matter, which therefore was evidently ſecreted into the ſtomach, juſt as a continual vomiting, of bilious matter ſhews a continual and extraordinary ſecretion of bile. Dr Wolf himſelf adopts this hypotheſis ſo far as to ſay, that perhaps the *ſerum* may become frothy; but in blood drawn from a vein not the leaſt fault appears either in the ſerum or craſſamentum. He affirms, however, that the duodenum appears to be one of the parts firſt and principally affected; and as it is not inflamed, it would ſeem that the affection it ſuſtains muſt ariſe from the vitiated ſtate of its juices.

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Be this as it will, however, in the hydrophobia, the ſtomach ſeems totally, or in a great meaſure, to loſe the power which at other times it poſſeſſes. Two grains of *cuprum ammoniacum* were repeatedly given to a child of eight years of age without effect; but this doſe would occaſion violent vomiting in a ſtrong healthy man. Something or other therefore muſt have prevented this ſubſtance from acting on the nervous coat of the ſtomach; and this we can only ſuppoſe to have been the exceedingly diſordered ſtate of the gaſtric juice, which occaſioned ſuch violent irritation through the whole body that the weaker ſtimulus of the medicine was entirely loſt. It would ſeem proper therefore to conſider the ſtomach in hydrophobic caſes as really containing a poiſonous matter, which could not be expelled by vomiting, becauſe it is renewed as faſt as evacuated. The indication therefore muſt be, to change its nature by ſuch medicines as are certainly more powerful than the poiſon; and this indication will naturally lead us to think of large doſes of alkaline ſalts. Theſe, it is certain, will deſtroy any animal-ſubſtance with which they come in contact, and render even the poiſon of ſerpents inactive. By exhibiting a few doſes of them, larger no doubt than what could be ſafely done on other occaſions, we would be certain to change the ſtate of the ſtomachic juices; and thus might free the patient from thoſe intolerable ſpaſms which always occaſion death in ſuch a ſhort time. Dr Wolf ſeems inclined to think that volatile alkalies were of ſervice; but the above hypotheſis would incline us to uſe rather the fixed kind. At any rate, it ſeems vain for phyſicians to truſt much to the power of opium, mercury, muſk, or cinnabar, either ſingly or combined in any poſſible way. The bark has alſo failed, and the moſt celebrated ſpecifics have been found ineffectual. Alkalies are the next moſt powerful remedies which the *materia medica* affords and they cannot be more unſucceſsful than the others have generally been.

Another remedy which ſeems adapted to change the nature of the gaſtric juices is ardent ſpirits. In one of Dr Wolf's patients two bottles of brandy ſeem to have effected a cure, The oil mixed with it was of no efficacy in other caſes, and the opium and turbith ſeem not to have been exhibited till the worſt was paſt. In this caſe the diſeaſe ſeems to have attacked the vaſcular as well as the nervous ſyſtem.

In all the patients the warm bath ſeems to have been a palliative, and a very powerful one, and as ſuch it ought never to be omitted, though we can by no means truſt to it as a radical cure; and the above hiſtories abundantly ſhow, that though the warm bath and opium may palliate for a ſhort time, the cauſe on which the ſpaſms depend is ſtill going on and increaſing, till at laſt the ſymptoms become too ſtrong to be palliated even for a moment by any medicine however powerful. At any rate, the abovementioned hypotheſis ſuggeſts a new indication, which, if attended to, may perhaps lead to uſeful diſcoveries. In caſes where putreſcent bile is abundantly ſecreted, columbo root and vegetable acids are recommended to change the nature of the poiſon which the body is perpetually producing in itſelf. Where corroſive mercury hath been ſwallowed, alkaline ſalt is recommended to deſtroy the poiſon which nature cannot expel by vomiting; and why ſhould not ſomething be attempted to deſtroy the poiſon which the ſtomach ſeems to ſecrete in the hydrophobia, and which nature attempts to expel, though in vain, by violent efforts to vomit?

But whatever plan may be purſued in the hopes of curing this dreadful malady after any of the ſymptoms have made their appearance, we ought in every inſtance of the accident that gives riſe to it, to direct our immediate care to *prevention*, as being perhaps the only real ground of hope: And the moſt certain and efficacious way of preventing the ill conſequences, is inſtantly (if it may be done) to cut out the piece in the place that happens to be bitten. Dr James, indeed, ſays, that he would have little opinion of cutting or cauteriſing, if ten minutes were ſuffered to elapſe from the receiving of the bite before the operation was performed. But in an inaugural diſſertation lately publiſhed at Edinburgh by Dr Parry, the author is of opinion that exciſion will be of uſe a conſiderable time after the bite is received. He adopts this opinion from what happens in the ſmall-pox, where the blood does not ſeem to receive the infection till ſome days after inoculation has been performed. A ſecond inflammation, he tells us, then takes place, and the infection is conveyed into the blood. In like manner, when the hydrophobous infection is about to be conveyed into the blood according to him, the wound, or its cicatrix, begins again to be inflamed; and it is this ſecond inflammation which does all the miſchief. Exciſion, or the cautery, will therefore be effectual any time betwixt the bite and the ſecond inflammation of the wound. Without implicitly truſting to this doctrine, however, or conſidering it as in any degree aſcertained in what manner the poiſon diffuſes itſelf, by what marks its progreſs may be known, or how ſoon the ſyſtem may be irremediably tainted with its malignity, it is undoubtedly ſafeſt not to loſe unneceſſarily a moment's time in applying the knife. This, or a dilation of the wound if it be ſmall, Dr Vaughan conſiders as the only prophylactics that can be depended upon. In the latter caſe, he directs to fill the wound with gunpowder, and ſet fire to it; which would produce a laceration of the part, and poſſibly the action of ignited powder upon the poiſon may have its uſe. In all caſes, likewiſe, after theſe practices have been employed, the wound ſhould be prevented from healing for ſome length of time.

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Hydrophobia ſpontanea, *Sauv.* ſp. 2.

This diſeaſe very much reſembles the former, ſo that it has undoubtedly been often miſtaken for it. It has been known to come on from an inflammation of the ſtomach, where it was cured by repeated and large blood-letting; in hyſteria, where it was cured by opium, muſk, or other antiſpaſmodics; and in putrid fevers, where it was cured by evacuating the inteſtinal canal of the putrid matters by repeated clyſters. A very good method of diſtinguiſhing the two is, that in the ſpontaneous hydrophobia the patient is much more delirious than in the genuine ſpecies. In the inſtance mentioned in the Medical Eſſays of this ſymptom attending the inflammation of the ſtomach, the patient *raved in the moſt extraordinary manner*. Dr Raymond ſays he remembers a ſpontaneous hydrophobia *attended with madneſs*; and in almoſt all the caſes of hydrophobia which are ſaid to have been cured, the patient was very delirious. Dr Nugent's patient was very frequently delirious, and dreaded *dogs* as well as water. In the Medical Tranſactions a caſe is communicated by W. Wrightſon ſurgeon in Sedgefield, Durham, of *canine madneſs* ſucceſsfully treated. This madneſs indeed came on after the bite of a dog ſaid to be mad: but it appeared only four days after the accident happened, and was attended with ſymptoms very unlike any of thoſe abovementioned; for he ſuddenly ſtarted up in a fit of delirium, and ran out of the houſe, and after being brought in, caught hold of the hot bars of the grate which held the fire: Whereas, in the true hydrophobia, the patients dread the fire, light, or any thing which makes a ſtrong impreſſion on the ſenſes, exceedingly. It is probable, therefore, that this was only a ſpontaneous hydrophobia, eſpecially as it readily yielded to veneſection, 30 drops of laudanum, and pills of a grain and an half of opium given every three hours, ſome boluſes of muſk and cinnabar, &c. while in ſome of the former caſes as much opium was given to a boy as would have deprived of life the ſtrongeſt healthy man had he ſwallowed it; and yet this amazing quantity produced ſcarce any effect. This patient alſo dreaded the ſight of a dog.

ORDER IV. VESANIÆ 325

Paranoiæ, *Vog.* Claſs IX.
Deliria. *Sauv.* Claſs VIII. Ord. III. *Sag.* Claſs XI. Ord. III.
Ideales, *Lin.* Claſs V. Ord. I.

GENUS LXV. AMENTIA. 326

FOLLY, or *Idiotiſm.*

Amentia, *Sauv.* gen. 233. *Vog.* 337. *Sag.* 346.
Moroſis, *Lin.* 106.
Stupiditas, Moroſis, Fatuitas, *Vog.* 336.
Amneſia, *Sauv.* gen. 237. *Sag.* 347.
Oblivio, *Lin.* 107. *Vog.* 338.
Memoriæ debilitas, *Junck.* 120.

GENUS LXVI. MELANCHOLIA. 327

MELANCHOLY *Madneſs.*

Melancholia, *Sauv.* gen. 234. *Lin.* 71. *Vog.* 332. *Sag.* 347. *Boerh.* 1089. *Junck.* 121.
Dæmonomania, *Sauv.* gen. 236. *Sag.* 348.
Dæmonia, *Lin.* 69.
Veſania. *Lin.* 70.
Paraphobia, *Lin.* 75.
Athymia, *Vog.* 329.

Delirium melancholicum, *Hoffm.* III. 251.
Erotomania, *Lin.* 82.
Noſtalgia, *Sauv.* gen. 226. *Lin.* 83. *Sag.* 338. *Junck.* 125.
Melancholia nervea, *Cl. Lorry* de melancholia, P. I.

328 Genus LXVII. MANIA.

Raving or Furious *Madneſs.*

Mania, *Sauv.* gen. 235. *Lin.* 68. *Vog.* 331. *Sag.* 349. *Boerh.* 1118. *Junck.* 122. *Battie* on Madneſs.
Paraphroſyne, *Lin.* 66.
Amentia, *Lin.* 67.
Delirium maniacum, *Hoffm.* III. 251.

Although theſe diſtempers may be conſidered as diſtinct genera, yet they are ſo nearly allied, and ſo readily change into each other, that it ſufficiently juſtifies the treating all of them together.

The diſtinguiſhing characteriſtic of madneſs, according to Dr Battie, is a *falſe perception;* and under this general character may be comprehended all kinds of what is called *madneſs*, from the moſt ſilly ſtupidity and idiotiſm to the moſt furious lunacy. Frequently the different kinds of madneſs are changed into each other by the caſual excitement of ſome paſſion: thus, an idiot may become furiouſly mad, by being put in a violent paſſion; though this does not ſo often happen as the change of melancholy into the raving madneſs, and *vice verſa.*

It is a very ſurpriſing circumſtance, that mad people are not only leſs liable to be ſeized with infectious, diſorders than thoſe who are in perfect health; but even when labouring under other diſeaſes, if the patients chance to be ſeized with madneſs, they are ſometimes freed from their former complaints. Of this kind Dr Mead relates two very remarkable inſtances.

On the other hand, it has been known, that an intermittent fever, ſupervening madneſs of long ſtanding, has proved a cure for the madneſs; the ſenſes having returned when the fever terminated. Dr Monro ſaw two inſtances of this himſelf; and mentions it as an obſervation of his predeceſſor in the care of Bethlem hoſpital.

Another remarkable circumſtance is, that immoderate joy, long continued, as effectually diſorders the mind as anxiety and grief. For it was obſervable in the famous South-Sea year, when ſo many immenſe fortunes were ſuddenly gained, and as ſuddenly loſt, that more people had their heads turned, from the prodigious flow of unexpected riches, than from the entire loſs of their whole ſubſtance.

Mad people, eſpecially of the melancholic kind, ſometimes obſtinately perſevere in doing things which muſt excite great pain; whence it ſhould ſeem as if their minds were troubled with ſome diſtracting notions, which make them patiently bear the preſent diſtreſs, leſt more ſevere tortures ſhould be inflicted; or poſſibly they may think, that, by thus tormenting the body, they render themſelves more acceptable to the divine Being, and expiate the heinous ſins of which they may imagine themſelves to have been guilty.

It is, however, alſo highly probable, that their feelings differ exceedingly from what they are in a natural ſtate; at leaſt they are every day obſerved to endure; apparently without the ſmalleſt uneaſineſs, watching, hunger, and cold, to an extent which in a ſtate of health would not only be highly diſtreſſing, but to the greater part of individuals would even prove fatal. And this reſiſtance of hunger, cold, and ſleep, affords perhaps the beſt teſt for diſtinguiſhing caſes of real inſanity, from caſes where the diſeaſe is only feigned, and appearances of it put on, to anſwer particular purpoſes; at leaſt where this power of reſiſtance is preſent, we have good reaſon to conclude that the affection is not feigned.

Cure. Although we be well acquainted with many of the remote cauſes of this diſeaſe, ſome of the principal of which have already been mentioned, yet we are ſtill ſo ignorant of the influence of theſe upon the ſyſtem, as giving a derangement of the mental faculties, that no general principles on which the cure may be conducted, can with any confidence be pointed out.

It may, however, be obſerved, that while ſome remedies ſeem to operate by producing an artificial termination of this complaint, many others have effect only as aiding a natural termination. And where a recovery from this diſeaſe does take place, it moſt frequently happens in conſequence of a natural convaleſcence. All the ſpecies and degrees of madneſs which are hereditary, or that grow up with people from their early youth, are out of the power of phyſic; and ſo, for the moſt part, are all maniacal caſes of more than one year's ſtanding, let them ariſe from what ſource ſoever. Very often mere debility, the dregs of ſome particular diſeaſe, ſuch as an ague, the ſmall-pox, or a nervous fever, ſhall occaſion different degrees of fooliſhneſs or madneſs. In theſe caſes, the cure muſt not be attempted by evacuations; but, on the contrary, by nouriſhing diet, clear air, moderate exerciſe, and the uſe of wine: whereas, in almoſt all the other maniacal caſes, which ariſe from different ſources, and which come on in conſequence of intemperate living, violent paſſions, or intenſe thinking, it is generally held, that evacuations of every kind are neceſſary, unleſs the conſtitution of the patient be ſuch as abſolutely forbids them.

Blood is moſt conveniently drawn either from the arm or jugulars; and if the weakneſs be ſuch as renders it improper to take away much blood, we may apply cupping-glaſſes to the occiput.

Vomiting, in weakly people, muſt be excited by the vinum ipecacuanæ; but in the more robuſt by emetic tartar or antimonial wine: the moſt efficacious cathartics are the infuſion or tincture of black hellebore, or infuſion of ſena quickened with tincture of jalap; but if there be ſuppreſſion of the menſes, or hæmorrhoidal diſcharge, then aloetic purges will be more proper; and in ſome inſtances cooling ſaline purgatives, ſuch as lixiviated tartar, are of great ſervice. In general, mad people require very large doſes, both of the emetics and cathartics, before any conſiderable operation enſues.

Dr Monro aſſures us, that the evacuation by vomiting is infinitely preferable to any other: the prodigious quantity of phlegm with which the patients in this diſeaſe abound, he ſays, is not to be got the better of but by repeated emetics; and he obſerves, that the purges have not their right effect, or do not operate to ſo good purpoſe, until the phlegm be broken and attenuated by frequent emetics. He mentions the caſe of a gentleman who had laboured under a melancholy for three years, from which he was relieved entirely by the uſe of vomits and a proper regimen. Increaſing the diſcharge by urine, is alſo of the greateſt moment, eſpecially when any degree of fever is preſent. The cutaneous diſcharges are alſo to be promoted; for which purpoſe the hot bath is of the higheſt ſervice in manaical caſes. Hoffman aſſerts, that he has ſeen numerous inſtances, both of inveterate melancholy and raging madneſs, happily cured by means of warm bathing; bleeding and nitrous medicines having been premiſed. Camphor has alſo been highly commended; but, if we can believe Dr Locker of Vienna, not very deſervedly. Having found very good effects from a ſolution of this medicine in vinegar, he took it for granted that all the ſucceſs was owing to the camphor; therefore, in order to give it a fair trial, he ſelected ſeven patients, and gave it in large doſes of half a drachm twice a-day. This was continued for two months, and the doctor was ſurpriſed to find that only one of his patients received any benefit. He then returned the other ſix back to the camphorated julep made with vinegar, and in a few weeks four of them recovered the uſe of their reaſon. This inclined him to think that the virtue depended ſolely on the vinegar, and accordingly he began to make the trial. Common vinegar was firſt given: but after a little while he fixed on that which had been diſtilled, and gave about an ounce and half of it every day; the patients having been previouſly prepared by bleeding and purging, which was repeated according as it was found neceſſary. He gives a liſt of eight patients who were cured by this method; ſome in ſix weeks, others in two months, and none of them took up more than three months in perfecting the cure. He does not indeed give the ages of the patients, nor mention the circumſtances of the caſe; he only mentions the day on which the uſe of the vinegar was begun and the day on which they were diſcharged; and he adds, that they all continued well at the time of his writing.

Dr Locker informs us, that this medicine acts chiefly as a ſudorific; and he obſerved, that the more the patients ſweated, the ſooner they were cured: it was alſo found to promote the menſtrual diſcharge in ſuch as had been obſtructed, or had too little of this ſalutary evacuation.

Both reaſon and experience ſhow the neceſſity of confining ſuch as are deprived of their ſenſes; and no ſmall ſhare of the management conſiſts in hindering them to hurt themſelves or do miſchief to other perſons. It has ſometimes been uſual to chain and to beat them: but this is both cruel and abſurd; ſince the contrivance called the *ſtrait waiſtcoat* anſwers every purpoſe of reſtraining the patients without hurting them.

Theſe waiſtcoats are made of ticken, or ſome ſuch ſtrong ſtuff; are open at the back, and laced on like a pair of ſtays; the ſleeves are made tight, and long enough to cover the ends of the fingers, where they are drawn cloſe with a ſtring like a purſe, by which contrivance the patient has no power of his fingers; and, when laid on his back in bed, and the arms brought acroſs the cheſt, and faſtened in that poſition by tying the ſleeve-ſtrings round the waiſt, he has no uſe of his hands. A broad ſtrap of girth-web is then carried acroſs the breaſt, and faſtened to the bedſtead, by which means the patient is confined on his back; and if he ſhould be ſo outragious as to require further reſtraint, the legs are ſecured by ligatures to the foot of the bed; or they may be ſecured by being both put into one bag not very wide, which may be more eaſily fixed than the feet themſelves, at leaſt without giving pain.

It is of great uſe in practice to bear in mind, that all mad people are cowardly, and can be awed even by the menacing look of a very expreſſive countenance; and when thoſe who have charge of them once impreſs them with the notion of fear, they eaſily ſubmit to any thing that is required. The phyſician, however, ſhould never deceive them in any thing, but more eſpecially with regard to their diſtemper: for as they are generally conſcious of it themſelves, they acquire a kind of reverence for thoſe who know it; and by letting them ſee that he is thoroughly acquainted with their complaint, he may very often gain ſuch an aſcendant over them that they will readily follow his directions.

It is a more difficult matter to manage thoſe whoſe madneſs is accompanied either with exceſſive joy or with great dejection and deſpondency, than thoſe who are agitated with rage: and all that can be done is to endeavour to excite contrary ideas, by repreſſing the immoderate fits of laughter in the one kind by chiding or threatening (taking care, however, not abſolutely to terrify them, which can never be done without danger, and has often added to the miſery of the unhappy ſufferer); and diſpelling the gloomy thoughts in the other, by introducing pleaſing concerts of muſic, or any other ſpecies of entertainment which the patients have been known to delight in while they had the uſe of their reaſon.

Though bliſtering the head has generally been directed, Dr Mead ſays he has oftener found it to do harm than ſervice: but he recommends iſſues in the back; and adviſes to keep the head always cloſe ſhaved, and to waſh it from time to time with warm vinegar. Opium has by many been forbidden in maniacal caſes, as ſuppoſing that it always increaſes the diſturbance; but there are inſtances where large doſes of this medicine have been found to prove a cure, and perhaps if it were tried oftener we ſhould find powerful effects from it: there certainly cannot much harm enſue from a few doſes, which may be immediately diſuſed if they ſhould be found to exaſperate the diſeaſe.

The diet of maniacal patients ought to be perfectly light and thin: their meals ſhould be moderate; but they ſhould never be ſuffered to live too low, eſpecially while they are under a courſe of phyſic: they ſhould be obliged to obſerve great regularity in their hours: even their amuſements ſhould be ſuch as are beſt ſuited to their diſpoſition; and after the diſeaſe appears to be ſubdued, chalybeate waters and the cold bath will be highly proper to ſtrengthen their whole frame and ſecure them againſt a relapſe.

329 GENUS LXVIII. ONEIRODYNIA.

Uneaſineſs in Sleep.

Somnium, *Vog.* 339.
Somnambuliſmus, *Sauv.* gen. 221. *Lin.* 77. *Sag.* 333.
Hypnobataſis, *Vog.* 340.
Noctambulatia, *Junck.* 124.
Ephialtes, *Sauv.* gen. 138. *Lin.* 163. *Sag.* 245.
Incubus, *Vog.* 221. *Junck.* 50.

The greateſt uneaſineſs which people feel in ſleep is that commonly called the *incubus* or *night-mare*. Thoſe ſeized with it ſeem to have a weight on their breaſts and about their præcordia. Sometimes they imagine they ſee ſpectres of various kinds which oppreſs or threaten them with ſuffocation. Neither does this uneaſineſs continue only while they are aſleep; for it is ſome time after they awake before they can turn themſelves in their beds or ſpeak; nay, ſometimes, though rarely, the diſtemper has proved mortal.—The incubus rarely ſeizes people except when the ſtomach is oppreſſed with aliments of hard digeſtion, and the patient lies on his back. It is to be cured by eating light ſuppers, and raiſing the head high; or, if it become very troubleſome, antiſpaſmodic medicines are to be adminiſtered, and the body ſtrengthened by chalybeates. The ſame method is to be followed by thoſe who are ſubject to walking in their ſleep; a practice which muſt neceſſarily be attended with the greateſt danger; and ſomnambuliſm may juſtly be conſidered as merely a different modification of this diſeaſe. Accordingly Dr Cullen has diſtinguiſhed the one by the title of *oneirodynia activa*, and the other by that of *oneirodynia gravans*.

330 CLASS III. CACHEXIÆ.

Cachexiæ, *Sauv.* Claſs X. *Sag.* Claſs VIII. *Sag.* Claſs III.
Deformes, *Lin.* Claſs X.

331 ORDER I. MACRORES.

Macies, *Sauv.* Claſs X. Order I. *Sag.* Claſs III. Order I.
Emaciantes, *Lin.* Claſs X. Order I.

332 GENUS LXIX. TABES.

Wasting of the *Body.*

Tabes, *Sauv.* gen. 275. *Lin.* 209. *Vog.* 306. *Sag.* 100.

This diſorder is occaſioned by the abſorption of pus from ſome ulcer external or internal, which produces an hectic fever. The primary indication therefore muſt be to heal the ulcer, and thus take away the cauſe of the diſeaſe. If the ulcer cannot be healed, the patient will certainly die in an emaciated ſtate. But the proper treatment of the tabes proceeding from this cauſe, falls to be conſidered under the head of *Ulcer* in SURGERY, and likewiſe under the genera SIPHYLIS, SCROFULA, SCORBUTICS, &c. diſeaſes in which ulcers are leaſt a very common ſymptom.

333 GENUS LXX. ATROPHIA.

Nervous Consumption.

Deſcription. This affection conſiſts principally in a waſting of the body, without any remarkable fever, cough, or difficulty of breathing; but attended with want of appetite and a bad digeſtion, whence the whole body grows languid, and waſtes by degrees.—Dr Cullen, however, aſſerts, that ſome degree of fever, or at leaſt of increaſed quickneſs of the pulſe, always attends this diſeaſe.

Cauſes. Sometimes this diſtemper will come on without any evident cauſe. Sometimes it will ariſe from paſſions of the mind; from an abuſe of ſpirituous liquors; from exceſſive evacuations, eſpecially of the ſemen, in which caſe the diſtemper hath got the name of *tabes dorſalis*. It may ariſe from mere old age, or from famine,

Prognoſis. This diſtemper, from whatever cauſe it may ariſe, is very difficult to cure, and often terminates in a fatal dropſy.

Cure. The general principles on which the treatment of this diſeaſe is to be regulated, very much depend on the cauſe by which it is induced; and it is unneceſſary to add, that this muſt be removed as far as poſſible. Next to this, the diſeaſe is moſt effectually combated by the introduction of nutritious aliment into the ſyſtem, and by obtaining the proper aſſimilation and digeſtion of this. With the firſt of theſe intentions, recourſe muſt be had to the diet that is moſt nutritious, and at the ſame time of eaſieſt digeſtion. But from the condition of the ſtomach commonly attending this diſeaſe, it is neceſſary ſmall quantities only ſhould be taken at a time, and that it ſhould be frequently repeated. With the ſecond intention, ſtomachic and nervous medicines are the articles chiefly at leaſt to be depended upon in this caſe. The Peruvian bark, elixir of vitriol, and chalybeates, are excellent; and theſe ſhould be conjoined with gentle exerciſe, as far as the ſtrength and other circumſtances of the patient will admit. In that ſpecies of the diſtemper occaſioned by venereal exceſſes, it is ſo eſſentially neceſſary to abſtain from them, that without it the beſt remedies will prove altogether uſeleſs. But this is ſo ſeldom complied with, that the tabes dorſalis almoſt always proves mortal.

334 ORDER II. INTUMESCNTIÆ.

Intumeſcentiæ, *Sauv.* Claſs X. Ord. II. *Sag.* Claſs III. Ord. II.
Tumidoſi, *Lin.* Claſs X. Ord. II.

335 GENUS LXXI. POLYSARCIA.

Corpulency.

Polyſarcia, *Sauv.* gen. 279. *Lin.* 213. *Vog.* 240. *Sag.* 160. Steatites, *Vog.* 390.

In a natural and healthy ſtate, the fat or animal oil, is not allowed to diffuſe itſelf throughout the cellular interſtices at large, but is confined to the places where ſuch an oily fluid is neceſſary, by a particular apparatus of diſtinct veſicles. But in ſome conſtitutions the oily part of the blood appears to exceed the requiſite proportion, and eaſily ſeparates from the other conſtituent parts; or there is an uncommon tendency to the ſeparation of oily matter. In theſe caſes it is apt to accumulate in ſuch quantities, that we may ſuppoſe it to burſt thoſe veſicles which were originally deſtined to hinder it from ſpreading too far; or almoſt every cell of the membrana adipoſa, many of which are in ordinary caſes altogether empty, may be completely filled with fat.

The increaſe of the omentum particularly, and the accumulation of fat about the kidneys and meſentery, ſwell the abdomen, and obſtruct the motions of the diaphragm; whence one reaſon of the difficulty of breathing which is peculiar to corpulent people; while the heart, and the large veſſels connected therewith, are in like manner ſo encumbered, that neither the ſyſtaltic nor ſubſultory motion can be performed with ſufficient freedom, whence weakneſs and ſlowneſs of the pulſe: but when the whole habit is in a manner overwhelmed with an oily fluid, the enlargement of the cellular interſtices will neceſſarily interrupt the general diſtribution and circulation throughout the nervous and vaſcular ſyſtems; impeding the action of the muſcular fibres, and producing inſenſibility, ſomnolency, and death.

Theſe caſes are the more deplorable, as there is but little proſpect of a cure. For the animal oil is of too groſs a nature to be eaſily taken up by abſorption; and we know, that when fluids are accumulated in the cellular ſyſtem, there are only two ways in which they can be carried off or eſcape; namely, by the abſorbents, which take their riſe from the cellular interſtices, and through the pores of the ſkin by tranſudation.

Another misfortune is, that the diſeaſe ſteals on ſo imperceptibly, that it becomes inveterate before people begin to think of purſuing the proper means of relief.

In this diſeaſe the cure muſt turn upon two points: Firſt, on preventing the farther depoſition of fat, by avoiding the introduction of ſuperfluous aliment, particularly of fatty matters, into the ſyſtem; and, ſecondly, on promoting and forwarding the abſorption of fat. On theſe grounds, beſides what may be done by proper regimen, a variety of articles have been recommended in the way of medicine.

Soap has been propoſed as a remedy to melt down and facilitate the abſorption of the fat in corpulent people; and Dr Fleming ſome years ago publiſhed a little treatiſe, wherein he recommends this medicine, and relates the caſe of a gentleman who is ſaid to have received conſiderable benefit from it. But perhaps the ſoap-leys would be more powerful, and might be more eaſily taken, ſheathed, as directed when recommended as a diſſolvent of the ſtone.

Lieutaud adviſes to take *acetum ſcilliticum* in ſmall doſes, with frequent purging and briſk exerciſe. But it will ſeldom happen that the patients will be found ſufficiently ſteady to perſiſt in any of theſe courſes, it being the nature of the diſorder to render them irreſolute and inattentive to their condition. Therefore the principal uſe of rules muſt be with a view to prevention; and perſons who are diſpoſed to corpulency ſhould take care in time to prevent it from becoming an abſolute diſeaſe, by uſing a great deal of exerciſe, not indulging in ſleep, and abridging their meals, eſpecially that of ſupper. Salted meats are leſs fattening than ſuch as are freſh; and drinking freely of coffee is recommended to corpulent people.

But Dr Fothergill obſerves, that a ſtrict adherence to vegetable diet reduces exuberant fat more certainly than any other means that he knows; and gives two caſes wherein this regimen ſucceeded remarkably well. The famous Dr Cheyne brought himſelf down in this way, from a moſt unwieldy bulk to a reaſonable degree of weight; as he himſelf informs us. It deſerves, however, to be remarked, that every practice for the removal or prevention of fatneſs muſt be uſed with great caution and prudence: for not a few, anxious to prevent this affection, have had recourſe to a regimen and to medicine which have proved fatal. This has particularly ariſen from the exceſſive uſe of acids, probably operating by entirely deſtroying the action of the chylopoietic viſcera.

GENUS LXXII. PNEUMATOSIS. 336
EMPHYSEMA, or *Windy Swelling*.

Pneumatoſis, *Sauv.* gen. 280. *Vog.* 391. *Sag.* 107.
Emphyſema, *Sauv.* gen. 13. *Lin.* 288. *Vog.* 392.
Leucophlegmatia, *Lin.* 214.

The emphyſema ſometimes comes on ſpontaneouſly; but more frequently is occaſioned by wounds of the lungs, which giving vent to the air, that fluid inſinuates itſelf into the cellular texture, and often blows it up to a ſurpriſing degree. It muſt be obſerved, however, that it is only in caſes of laceration of the lungs where this diſeaſe can take place; for in a ſimple wound, the effuſion of blood always prevents the air from getting out. The cure is to be accompliſhed by ſcarifications and compreſſes; but in ſome caſes only by the paracenteſis of the thorax. When air introduced from the lungs is collected in a conſiderable quantity in the cavity of the thorax, the operation of the paracenteſis is perhaps the only means of cure. Upon an opening being thus made, the air ſometimes ruſhes out with incredible violence; and the patient receives at leaſt immediate relief from circumſtances the moſt diſtreſſing imaginable. In ſome inſtances it is followed even by a complete cure.

GENUS LXXIII. TYMPANITES. 337
TYMPANY.

Tympanites, *Sauv.* gen. 291. *Lin.* 219. *Vog.* 316
Sag. 118. *Boerh.* 226. *Junck.* 87.
Affectio tympanitica, *Hoffm.* III. 339.
Meteoriſmus, *Sauv.* gen. 292.

This is an inflation of the abdomen, and is of two kinds: 1. That in which the flatus is contained in the inteſtines, in which the patient has frequent exploſions of wind, with a ſwelling of the belly frequently unequal. 2. When the flatus is contained in the cavity of the abdomen; in which caſe the ſwelling is more equal, and the belly ſounds when ſtruck, without any conſiderable emiſſion of flatus. Of theſe two, however, the former diſeaſe is by much the moſt common; inſomuch, that many, even extenſively engaged in practice, have never met with an inſtance of true abdominal tympanites. In both caſes the reſt of the body falls away.

Cauſes, &c. The tympany ſometimes takes place in thoſe who have been long troubled with flatulencies in the ſtomach and inteſtines. It happens frequently to women after abortion; to both ſexes after the ſuppreſſion of the hæmorrhoids; and ſometimes from tedious febrile diſorders injudiciouſly treated.

Prognoſis. This diſeaſe is generally very obſtinate, and for the moſt part proves fatal by degenerating into an aſcites. Sometimes, if the patient be healthy and ſtrong, the diſeaſe may terminate favourably, and that the more readily if it has followed from ſome diſorder. A hectic conſumption, dry cough, and emaciated countenance in a tympany, with a ſwelling of the feet, denote approaching death in a very ſhort time.

Cure. With a view to the prevention of this affection, it is neceſſary, in the firſt place, to avoid, as far as it can be done, cauſes giving riſe to an uncommon extrication of air, by preſerving the proper tone of the alimentary canal. After this affection has taken place, the indications are, firſt, to expel the air already extricated and confined in different cavities; and, ſecondly, to prevent further accumulation. On theſe grounds different remedies are employed. The cure, however, is principally attempted by carminative, reſolvent, and ſtomachic medicines, gentle laxatives, and at laſt tonics, eſpecially chalybeates. In the Edinburgh Medical Eſſays, Vol. I. we have a very remarkable hyſtory of a tympany by Dr Monro ſenior. The patient was a young woman of 22 years of age, who fell into the diſtemper after having a tertian ague, in which ſhe was badly treated. She became a patient in the Edinburgh Infirmary the 24th of March 1730; took ſeveral purgatives; and ſome doſes of calomel; uſed the warm bath; and had an antihyſteric plaſter applied over the whole belly, but with very little effect. She was monſtrouſly diſtended, inſomuch that the ſkin ſeemed to be in danger of burſting: her breathing was much ſtraitened; but the ſwelling ſometimes gradually decreaſed without any evacuation. The returns and degree of this ſwelling were very uncertain; and when the belly was moſt detumefied, ſeveral unequal and protuberant balls could be felt over the whole abdomen, but eſpecially at its ſides. Her ſtomach was good, ſhe had no thirſt, and her urine was in proportion to the quantity ſhe drank. She was very coſtive, had her menſes at irregular periods, but no œdematous ſwellings appeared in the feet or any where elſe. In this ſituation ſhe continued from the time of her admiſſion till the 21ſt of June, during which interval ſhe had only her menſes twice. Throughout this ſpace of time, the following circumſtances were obſerved, 1. Several times, upon the falling of the ſwelling, ſhe complained of a headach; once of pains throughout all her body, once of a giddineſs, twice of a nauſea and vomiting, and the laſt time threw up green bile; and once her ſtomach ſwelled greatly, whilſt the reſt of the abdomen ſubſided. 2. During the flowing of the menſes ſhe did not ſwell, but became very big upon their ſtopping. 3. Blood-letting and emetics, which were made uſe of for ſome accidental urgent ſymptoms, had no very ſenſible effect in making the tympany either better or worſe. 4. She never had paſſage of wind either way except a little belching ſome days before the firſt monthly evacuation.

Some time before the laſt eruption of the menſes, the purgatives were given more ſparingly; and antihyſterics of the ſtrongeſt kinds, ſuch as aſafœtida, oleum corn. cerv. &c. mixed with ſoap, were given in large doſes, accompanied with the hotter antiſcorbutics as they are called, as horſe-radiſh and ginger-root infuſed in ſtrong ale with ſteel. The patient was ordered to uſe frequent and ſtrong frictions to all the trunk of her body and extremities, and to uſe moderate exerciſe. Immediately before the menſtrua began to flow, clyſters of the ſame kind of medicines were injected. The menſes were in ſufficient quantity; but as ſoon as they ceaſed, her belly increaſed in its circumference four inches and a half, but ſoon ſubſided. She then complained of pains, which a gentle ſweat carried off. Borborygmi were for the firſt time obſerved on the ſame day, June 25th; and having taken ſome *tinctura ſacra* at night, ſhe paſſed a ſmall quantity of blood by ſtool. This was the firſt appearance of the return of the hæmorrhoids, to which ſhe had been formerly ſubject.

The two following days her ſaponaceous, antihyſteric, and antiſcorbutic medicines being ſtill continued, ſhe had ſuch exploſions of wind upwards and downwards, that none of the other patients would remain in the ſame room, nay ſcarce on the ſame floor with her. Her belly became leſs and ſofter than it had been from the firſt attack of the diſeaſe; her medicines, with a doſe of ſyrup of buckthorn at proper intervals, ſtill were continued, only the proportion of ſteel was increaſed; her flatulent diſcharge went on ſucceſsfully, and ſhe gradually recovered her former health.

GENUS LXXIV. PHYSOMETRA. 338

WINDY SWELLING of the Uterus.

Phyſometra, *Sauv.* gen. 290. *Sag.* 119.
Hyſterophyſe, *Vog.* 317.

THE treatment of this is not different from that of the tympany. It is however, upon the whole, a very rare diſeaſe; and when it takes place, very ſeldom if ever admits of a cure.

GENUS LXXV. ANASARCA. 339

WATERY SWELLING over the whole Body.

Anaſarca, *Sauv.* gen. 281. *Lin.* 215. *Vog.* 313. *Sag.* 108. *Boerh.* 1225. *Hoffm.* III. 322. *Junck.* 87. *Monro* on the Dropſy. *Millman* Animadverſiones de hydrope 1779.
Phlegmatia, *Sauv.* gen. 282.
Angina aquoſa, *Boerh.* 791.

IN this diſeaſe the feet firſt begin to ſwell, eſpecially in the evening, after exerciſe, and when the patient has ſtood or ſat long; which ſwelling riſes frequently to the thighs. By lying in bed, the ſwelling becomes leſs, or even almoſt diſappears. In the progreſs of the diſeaſe, the ſwelling often riſes to the hips, loins, and belly, and at laſt covers the whole body. This diſeaſe, beſides the other ſymptoms afterwards mentioned under ASCITES, is attended with a remarkable

able difficulty of breathing. In the cure of this, as well as other ſpecies of dropſy, the general intentions are, firſt, the evacuation of the water already effuſed either by natural or artificial outlets; and, ſecondly, the prevention of it from accumulation, which is chiefly to be expected from ſupporting a due action of the abſorbents, and from keeping up a proper diſcharge by the ſerous excretories.

The remedies employed with theſe intentions are much the ſame with what are employed againſt the more important genus of aſcites. Only it may be here noticed, that in anaſarca it is uſual to ſcarify the feet and legs. By this means the water is often diſcharged: but the operator muſt be cautious not to make the inciſion too deep; they ought barely to penetrate through the ſkin; and eſpecial care muſt be taken, by ſpirituous fomentations and proper digeſtives to prevent a gangrene. Dr Fothergill obſerves. that the ſafeſt and moſt efficacious way of making theſe drains is by the inſtrument uſed for cupping, called a *ſcarificator;* and he always orders it to be ſo applied as to make the little wounds tranſverſely; as they not only diſcharge better, but are alſo longer in healing, than when made longitudinally.

Notwithſtanding every precaution, however, gangrene will often enſue; and it is upon the whole a much ſafer practice to evacuate the water by the natural outlets, the valvular lymphatic abſorbents; and with this intention emetics and cathartics, but particularly diuretics, are often employed with ſucceſs.

340 GENUS LXXVI. HYDROCEPHALUS.

WATER in the HEAD.

Hydrocephalus, *Sauv.* gen. 285. *Lin.* 216. *Boerh.* 1217.

Hydrocephalum, *Vog.* 384.

THIS differs from the hydrocephalus formerly treated of at ſome length under the title of Apoplexia Hydrocephalica, chiefly in the water being collected in the external parts of the head, whereas the former is entirely within the ſkull. In the fifth volume of the Medical Obſervations we have an account of a very extraordinary caſe of this kind. The patient was a child only of a few days old, and had a tumor on his head about the ſize of a common tea-cup, which had the appearance of a bladder diſtended with water; near the apex was a ſmall opening, through which a bloody ſerum was diſcharged. In other reſpects the child was healthy. No application was uſed but a piece of linen dipt in brandy. The tumor continued to increaſe for many months; at the end of which time the membrane containing the water appeared equally thick with the other part of the ſcalp, except one place about the ſize of a ſhilling, which continued thin, and at times appeared as if it would burſt. He continued in this ſituation for about 17 months, when the circumference of the head was 20 inches, the baſe $16\frac{1}{2}$, the midde $11\frac{1}{2}$, and from the baſe to the apex near $8\frac{1}{2}$. The water was then drawn off, and the child died in two days. Almoſt all other caſes of this diſtemper have proved fatal; the ſutures of the ſkull generally give way, and the whole external part of the head is equally enlarged: but in the inſtance juſt now given there was a deficiency of part of the bones. Although however, in ſome inſtances where the head is thus enlarged to an enormous ſize, the water is exterior to the brain, and therefore intitled to the appellation of hydrocephalus exterior, yet much more frequently in thoſe inſtances where there is a manifeſt ſeparation of the bones of the cranium at the ſutures, the water is ſtill contained within the ventricles; and accordingly the diſeaſe may be much more properly diſtinguiſhed into the *acute* and *chronic* hydrocephalus, than as is commonly done into the *internal* and *external.* Although the latter be much ſlower in its progreſs, ſometimes ſubſiſting even for years, yet it is equally difficult of cure with the former, and very often it proves fatal in a few days if the water be drawn off by an artificial opening, which may be very eaſily performed by a mere puncture with a common lancet, without either pain or any immediate hazard from the operation itſelf although the water be lodged in the venetricles; for theſe are diſtended to an enormous ſize, and the ſubſtance of the brain almoſt totally deſtroyed, ſo that hardly any thing is to be punctured but membranes.

GENUS LXXVII. HYDRORACHITIS. 341

SPINA BIFIDA.

Hydrorachitis, *Sauv.* gen. 287. *Morgagn.* de ſed. XII. 9. *et ſeq.*

Spinola, *Lin.* 289.

Spina bifida, *Vog.* 386.

This diſeaſe, which conſiſts in a ſoft tumor on the lumbar vertebræ, attended with a ſeparation of the vertebræ themſelves, though generally conſidered as approaching to the nature of rachitis, is commonly referred to the article SURGERY, which may be conſulted with regard to this affection.

GENUS LXXVIII. HYDROTHORAX. 342

DROPSY of the BREAST.

Hydrothorax, *Sauv.* gen. 150. *Vog.* 311. *Boerh.* 1219.

This affection, particularly with reſpect to its cauſes, is in many circumſtances ſimilar to other kinds of dropſy, particularly to aſcites. But from the ſituation of the water which is here depoſited in the cavity of the thorax, it may naturally be ſuppoſed that ſome peculiar ſymptoms will occur. Beſides the common ſymptoms of dropſy, paleneſs of the countenance, ſcarcity of urine, and the like, this diſeaſe is, in ſome inſtances, attended with a fluctuation of water within the breaſt; which when it does occur may be conſidered as a certain diſtinguiſhing mark of this affection. But beſides this, it is alſo diſtinguiſhed by the remarkable affections of circulation and reſpiration with which it is attended.

The breathing is peculiarly difficult, eſpecially in a recumbent poſture; and in many inſtances patients cannot breathe, with tolerable eaſe, unleſs when ſitting erect, or even ſtooping ſomewhat forwards. The pulſe is very irregular, and has often remarkable intermiſſions. But the diſeaſe has been thought to be principally characterized by a ſudden ſtarting from ſleep, in conſequence of an almoſt inexpreſſible uneaſy ſenſation referred

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referred to the breaſt, and attended with ſtrong palpitation, which may probably ariſe from an affection either of circulation or of reſpiration.

That theſe ſymptoms are common attendants of this diſeaſe is undeniable; and they are certainly the beſt characteriſtics of this affection with which we are yet acquainted: but it muſt be allowed that they are preſent in ſome caſes where there is no water in the breaſt; and that in other inſtances where the diſeaſe exiſts, they are either altogether wanting, or occur only to a very ſlight degree. Certain diagnoſtics, therefore, of this diſeaſe ſtill remain to be diſcovered.

When hydrothorax is preſent from the affection of the vital functions with which it is attended, it may readily be concluded that it is a dangerous diſeaſe, and in many inſtances it proves fatal. The cure, as far as it can be accompliſhed, is obtained very much on the ſame principle as in other dropſies. Here, however, probably from the uncertainty of the diagnoſtics, the artificial abſtraction of water, by paracenteſis of the thorax, is leſs frequently had recourſe to than in aſcites; though in ſome inſtances, after other means have failed, it has been ſaid not only to give relief of ſymptoms highly urgent, particularly dyſpnœa, but even to produce a complete cure. Benefit is often obtained from an artificial diſcharge of water by the application of bliſters to the breaſt: but in this, as well as other dropſies, a diſcharge is chiefly effected by the natural outlets, particularly from the uſe of cathartics and diuretics. In this ſpecies of dropſy, more perhaps than in any other, recourſe has been had to the uſe of the digitalis purpurea, or fox-glove, ſo ſtrongly recommended as a diuretic by Dr Withering in his Treatiſe reſpecting the uſe of it. There can be no doubt that this article tho' ſometimes productive of inconvenience from the diſtreſſing ſickneſs and ſevere vomiting which it not unfrequently excites though uſed even but in ſmall doſes, often operates as a powerful diuretic, and produces a complete evacuation of water, after other articles have failed. From the effects mentioned above, however, as well as from its influence on the pulſe, which it renders much ſlower, it is neceſſary that it ſhould be employed with great caution and in ſmall doſes. A dram of the dried leaves of the digitalis, macerated for four hours in half a pint of warm water, forms an infuſion which may be given in doſes of an ounce, and the dried powder of the leaves in doſes of one or two grains: theſe doſes may be gradually increaſed, and repeated twice or oftener in the day; but this requires to be done with great caution, leſt ſevere vomiting, or other diſtreſſing ſymptoms, ſhould take place.

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Genus LXXIX. ASCITES.

Dropsy of the Abdomen.

Aſcites, *Sauv.* gen. 288. *Lin.* 217. *Vog.* 314. *Sag.* gen. 115. *Boerh.* 1226. *Hoffm.* III. 322. *Junck.* 87. *D. Monro* on the Dropſy, 1765. *Milman*, Animadverſiones de Hydrope, 1779.

Deſcription. This diſeaſe aſſumes three different forms: 1. When the water immediately waſhes the inteſtines. 2. When it is interpoſed between the abdominal muſcles and peritonæum; or, 3. When it is contained in facs and hollow veſicles; in which caſe it is called the *encyſted dropſy*. Some phyſicians of great reputation have aſſerted, that the water was often placed within the duplicature of the peritonæum: but this is alleged by Dr Milman to be a miſtake, as that membrane is looked upon by the beſt anatomiſts to be ſingle; and he thinks that the abovementioned phyſicians have been led into this error from obſerving the water collected in the cellular ſubſtance of the peritonæum.

Aſcites.

In the beginning of an aſcites the patient becomes languid, breathleſs, and has an averſion at motion: his belly ſwells; and when ſtruck, the ſound of fluctuating water is perceptible; there is a difficulty of breathing when the belly is preſſed. There is an almoſt continual thirſt, which in the progreſs of the diſeaſe becomes very urgent; the urine is thick, in ſmall quantity, and red. The pulſe is ſmall and frequent; and as the body ſwells, the other parts waſte away. A fever at laſt ariſes, which, conſtantly increaſing, in the end carries off the patient. Theſe ſymptoms are moſt urgent where the waters are in immediate contact with the inteſtines; in the other kinds the reſt of the body is leſs waſted; nor is there ſo great thirſt or difficulty of breathing.

Cauſes, &c. The immediate cauſe of dropſy is a greater effuſion of ſerum by the exhalant arteries than the abſorbents take up. This may be occaſioned either by too great a quantity of liquid thrown out by the former, or by an inability of the latter to perform their office. This commonly happens in people whoſe bodies are of a weak and lax texture, and hence women are more ſubject to this malady than men; chlorotic girls eſpecially are very apt to become dropſical.

Sometimes, however, this diſeaſe is occaſioned by a debility of the vital powers, by great evacuations of blood, or by acute diſeaſes accidentally protracted beyond their uſual period; and although this cauſe ſeems very different from a laxity of fibres, yet the dropſy ſeems to be produced in a ſimilar manner by both. For the vital powers being debilitated by either of theſe cauſes, naturally bring on a certain debility and laxity of the ſolids; and on the other hand a debility of the ſolids always brings on a debility of the vital powers; and from this debility of the vital powers in both caſes it happens, that thoſe humours which ought to be expelled from the body are not, but accumulate by degrees in its cavities. There is, however, this difference between the two kinds of dropſy ariſing from theſe two different cauſes, That in the one which ariſes from laxity the ſolid parts are more injured than in that which ariſes from a debility of the vital powers. In the former, therefore, the water ſeems to flow out from every quarter, and the body ſwells all over. But when the diſeaſe is occaſioned by a debility of the vital powers, though the ſolids be leſs damaged, yet the power of the heart being much diminiſhed, and the humours ſcarce propelled through the extreme veſſels, the thin liquids, by which in a healthy ſtate the body is daily recruited, are carried by their own weight either into the cavities or into the cellular texture. Hence thoſe aqueous effuſions which follow great evacuations of blood, or violent

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lent looſeneſſes, begin in the more depending parts of the body, gradually aſcending, till they arrive at the cavity of the abdomen, or even the thorax.

But another and much more ſufficient cauſe for the production of dropſy is an obſtruction of the circulation; and this may take place from polypi in the heart or large veſſels, and hard ſwellings in the abdomen. Inſtances have been obſerved of a dropſy ariſing from ſteatomatous tumors in the omentum, and many more from a ſcirrhous liver or ſpleen, and from an infarction and obſtruction of the meſenteric glands, by which means the lymph coming from the extremities is prevented from arriving at the heart. Scirrhoſity of the liver, the moſt common cauſe of aſcites, probably operates by augmenting effuſion in conſequence of its preventing the return of the venous blood, the greater part of the veins from the abdomen going to the formation of the vena portarum.

Laſtly, whatever, either within or without the veſſels, contracts or ſhuts up their cavities, produces a more copious and eaſy tranſmiſſion of the thin humours through the exhalant arteries, at the ſame time that it prevents their return by the abſorbent veins. This has been eſtabliſhed by experiment. For Lower having perforated the right ſide of the thorax in a dog, tied the *vena cava*, and ſewed up the wound. The animal languiſhed for a few hours, and then died. On diſſection, a great quantity of ſerum was found in the abdomen, as if he had long laboured under an aſcites. In like manner, having tied the jugular veins of another dog, a ſurpriſing ſwelling took place in thoſe parts above the ligatures, and in two days the creature died. On diſſection, all the muſcles and glands were vaſtly diſtended, and quite pellucid, with limpid ſerum. From theſe experiments, and ſome caſes of the diſeaſe mentioned by different authors, it appears, that when the veins are obſtructed ſo that they cannot receive the arterial blood, the ſerum is ſeparated as by a filtre into the more open cavities and laxer parts of the body, while the thicker part ſtagnates and is collected in the proper blood-veſſels.

The too great tenuity of the humours is very frequently accuſed as the cauſe of dropſy, and many authors have aſſerted that dropſy might ariſe merely from a ſuperabundance of water in the blood. For this ſome experiments are quoted, from which they would infer, that when a great quantity of aqueous fluid is introduced into the blood, the ſuperfluous fluid ought by no means to paſs through the extremities of the ſanguiferous arteries into the veins in the common courſe of circulation, but by being effuſed into the cavities ſhould produce a dropſy. But this can only happen when the vital powers are very much diminiſhed; for, in a natural ſtate, the ſuperfluous quantity is immediately thrown out by the ſkin or the kidneys: and agreeable to this we have an expriment of Schultzius, who induced a dropſy in a dog by cauſing him drink a great quantity of water; but he had firſt bled him almoſt *ad deliquium*, ſo that the vital powers were in a manner oppreſſed by the deluge of water. In this manner do thoſe become hydropic who are ſeized with the diſeaſe on drinking large quantities of water either when wearied with labour, or weakened by ſome kinds of diſeaſes. Dr Fothergill relates an inſtance of a

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perſon who, being adviſed to drink plentifully of barley-water, in order to remove a fever, raſhly drunk 12 pounds of that liquor every day for a month, and thus fell into an almoſt incurable diſtemper. But if this quantity had been taken only during the prevalence of the fever, he would in all probability have ſuffered no inconvenience, as is probable from what has been related concerning the *diæta aquea* uſed by the Italians.

It is moreover evident from experiments, that, in a healthy ſtate, not only water is not depoſited in the cavities, but that if it is injected into them it will be abſorbed, unleſs ſome laxity of the ſolids has already taken place. Dr Muſgrave injected into the right ſide of the thorax of a dog four ounces of warm water; whence a difficulty of breathing and weakneſs immediately followed. But theſe ſymptoms continually leſſened, and in the ſpace of a week the animal ſeemed to be in as good health as before. Afterwards he injected 16 ounces of warm water into the left cavity of the thorax in the ſame dog; the ſame effects followed, together with great heat, and ſtrong pulſation of the heart; but he again recovered in the ſpace of a week. Laſtly, he injected 18 ounces of water into one ſide of the thorax, and only ſix into the other: the ſame ſymptoms followed, but vaniſhed in a much ſhorter time; for within five days the dog was reſtored to perfect health. During this time, however, he obſerved that the creature made a greater quantity of urine than uſual.

The remote cauſes of dropſy are many and various. Whatever relaxes the ſolids in ſuch a manner as to give an occaſion of accumulation to the ſerous fluids, diſpoſes to the dropſy. A lazy indolent life, rainy wet weather, ſwampy or low ſoil, and every thing which conduces to vitiate the viſcera, or inſenſibly to produce obſtructions in them, paves the way for a dropſy. Hence thoſe are ready to fall into the diſeaſe who uſe hard and viſcid aliments, ſuch as poor people in ſome countries who uſe coarſe brown bread, and children who are fed with unwholeſome aliments; and the ſame thing happens to thoſe who drink immoderately of ſpirituous liquors.

Prognoſis. When the dropſy ariſes from a ſcirrhus of the liver or ſpleen, or any of the other viſcera, the prognoſis muſt always be unfavourable, and alſo when it ariſes from diſorders of the lungs. Neither is the caſe more favourable to thoſe in whom the ſmall veſſels are ruptured, and pour out their liquids into the cavity of the abdomen. Thoſe certainly die who have polypi in the veſſels, or tumors compreſſing the veins and veſſels of the abdomen. A dropſy ariſing from obſtructions in the menſenteric glands is likewiſe difficult to cure, whether ſuch obſtructions ariſe from a bad habit of body, or from any other cauſe; if we can, however, by any means remove the diſeaſe of the glands, the dropſy eaſily ceaſes. But in thoſe who fall into dropſy without any diſeaſe preceding, it is not quite ſo dangerous; and even though a diſeaſe has preceded, if the patient's ſtrength be not greatly weakened, if the reſpiration be free, and the perſon be not affected with any particular pain, we may entertain great hopes of a cure. But where a great loſs of blood is followed by a fever, and that by a dropſy, the patients almoſt always die, and that in a ſhort time: thoſe, however, are very frequently cured who fall into this diſeaſe without any preceding hæmorrhagy.

Cure. In the cure of this diſeaſe authors chiefly mention two indications. 1. To expel the ſuperfluous quantity of water; and, 2. To prevent its being again collected. But before we proceed to ſpeak of the remedies, it is neceſſary to take notice, that by the animal economy, if a great evacuation of a fluid takes place in any part of the body, all the other fluids in the body are directed towards that part, and thoſe which lie as it were lurking in different parts will be immediately abſorbed, and thrown out by the ſame paſſage. Hence the humours which in hydropic perſons are extravaſated into the different cavities of the body will be thrown into the inteſtines, and evacuated by purgatives; or by diuretics will be thrown upon the kidneys, and evacuated by urine. It is, however, not only neceſſary to excite theſe evacuations in order to remove this malady, but they muſt be aſſiduouſly promoted and kept up till the abundant humour is totally expelled. For this reaſon Sydenham has adviſed purgatives to be adminiſtered every day, unleſs, either through the too great weakneſs of the body, or the violent operation of the purgative, it ſhall be neceſſary to interpoſe a day or two now and then; becauſe if any conſiderable intervals be allowed to take place between the exhibition of the purgatives, an opportunity is given to the waters of collecting again. In this method, however, there is the following inconvenience, that, when the waters are totally evacuated, the ſtrength is at the ſame time ſo much exhauſted, that the diſtemper commonly returns in a very ſhort time. Hence almoſt our only hopes of curing a dropſy conſiſt in gently evacuating the waters by means of diuretics. But the efficacy of theſe is generally very doubtful. Dr Friend hath long ago obſerved, that this part of medicine is of all others the moſt lame and imperfect; but a French phyſician, Mr Bacher, lately diſcovered, as he alleges, a method of making the diuretics much more ſucceſsful. His reputation became at laſt ſo great, that the French king thought proper to purchaſe his ſecret for a great ſum of money. The baſis of his medicine was hellebore-root, the malignant qualities of which he pretended to correct in the following manner. A quantity of the dried roots of black hellebore were pounded, and then put into a glazed earthen veſſel, and afterwards ſprinkled with ſpirit of wine. They were ſuffered to ſtand for twelve hours, ſtirring them about twice or thrice during that ſpace of time. They were then ſprinkled again, and at laſt good Rheniſh wine was poured on till it ſtood ſix fingers above the roots. The mixture was frequently agitated with a wooden ſpatula; and as the wine was imbibed by the roots, more was poured on, ſo as to keep it always at the ſame height for 48 hours. The whole was then put on the fire and boiled for half an hour, after which the decoction was violently preſſed out; the ſame quantity of wine was added as at firſt, and the mixture boiled as before. After the ſecond expreſſion the woody reſiduum was thrown away as uſeleſs. Both the ſtrained liquors are then mixed together with two parts of boiling water to one of the decoction. The whole is afterwards evaporated in a ſilver veſſel to the conſiſtence of a ſyrup. One part of the extract is again added with two parts of boiling water, and the whole inſpiſſated as before.—By this means, ſays he, the volatile nauſeous acrid particles are ſeparated by evaporation, and the fixed ones remain corrected and prepared for medicinal uſes; adding, towards the end, a ninth part of old brandy, and evaporating to the conſiſtence of turpentine. Mr Bacher reaſons a good deal on the way in which this proceſs corrects the medicine; but tells us, that notwithſtanding the improvement, his pills will not have the deſired effect unleſs properly made up. For forming them, they ought to be mixed with matters both of an inviſcating and indurating nature; yet ſo prepared that it will be readily ſoluble in the ſtomach, even of a perſon already debilitated. For anſwering theſe purpoſes, he choſe myrrh and carrduus benedictus, and then gives the following receipt for the formation of his pills.

"Take of the extract of hellebore prepared as above directed, and of ſolution of myrrh, each one ounce; of powdered carduus benedictus three drachms and a ſcruple. Mix them together, and form into a maſs, dividing it into pills of a grain and an half each." To theſe pills Mr Bacher gives the name of the *pilulæ tonicæ*, from an idea, that while they evacuate the water, they at the ſame time act as tonics; and thus from augmenting the action of the lymphatics, prevent the return of the diſeaſe. And if both theſe intentions could be effectually anſwered by the uſe of the ſame remedy, it would unqueſtionably be of great importance in practice.

The effects of theſe pills were, we are told, very ſurpriſing. Dr Daignan relates, that he gave them to 18 hydropic patients at once; and theſe he divided into three claſſes, according to the degree of the diſeaſe with which they were affected. The firſt claſs contained thoſe who laboured under an anaſarca following intermittent fevers. The ſecond claſs contained thoſe who had an anaſarca, together with ſome degree of aſcites, ariſing from tedious febrile diſorders. All theſe were cured; but theſe two claſſes conſiſted of ſuch caſes as are moſt eaſily removed. But the third contained ſix who were ſeized with a moſt violent anaſarca and aſcites, after being much weakened by tedious diſorders, and of conſequence in whom the diſeaſe was very difficult to be cured. Even of theſe, however, four were cured, and the other two died. The body of one of theſe being diſſected, both ſides of the cavity of the thorax were found to be full of a blackiſh-red water. The lungs were unſound; there was a polypous concretion in the right ventricle of the heart; the liver and ſpleen were hard, and of a preternatural bulk; and the glands of the meſentery were obſtructed and infarcted. In the other, the liver and pancreas were ſcirrhous, and the ſpleen very hard.

The ſame medicines were given by De Horne to eight perſons, ſix of whom had both an anaſarca and aſcites, but the other two only an aſcites. Four of theſe recovered; three died without being freed from the dropſy; one in whom the dropſy was cured died in a ſhort time after, having for ſome time before his death become ſpeechleſs.

By theſe patients 10 of the pills were taken at once;

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and the ſame doſe repeated to the third time, with an interval of an hour betwixt each doſe. At firſt they proved purgative, and then diuretic; by which laſt evacuation they finally cured the diſeaſe. But though Mr Bacher was firmly of opinion that his pills cured the dropſy by reaſon of the above-related correction; yet it is certain that, in the hands of other practitioners, theſe very pills have failed, unleſs they alſo made uſe of the ſame regimen recommended by that phyſician; while, on the other hand, it is alſo certain, that different medicines will prove equally efficacious in dropſical caſes, provided this regimen is made uſe of.

For a great number of ages it has been recommended to dropſical patients to abſtain as much as poſſible from drink, and thus to the torments of their diſeaſe was added that of an intolerable thirſt; and how great this torment was, we may underſtand from an example of a friend of king Antigonus, who, having been cloſely watched both by order of the phyſicians and alſo of the king, was ſo unable to bear the raging thirſt occaſioned by his diſeaſe, that he ſwallowed his own excrements and urine, and thus ſpeedily put an end to his life. Dr Milman ſhows at great length the pernicious tendency of this practice. He maintains that it is quite contrary to the ſentiments of Hippocrates and the beſt ancient phyſicians. He aſſerts, that unleſs plenty of diluting drink be given, the beſt diuretics can have no effect. He condemns alſo in the ſtrongeſt terms the practice of giving dropſical patients only dry, hard, and indigeſtible aliments. Theſe would oppreſs the ſtomach even of the moſt healthy; and how much more muſt they do ſo to thoſe who are already debilitated by labouring under a tedious diſorder? By what means alſo are theſe aliments to be diſſolved in the ſtomach when drink is with-held? In this diſeaſe the ſaliva is viſcid, and in ſmall quantity; from whence it may be reaſonably conjectured, that the reſt of the fluids are of the ſame nature, and the gaſtric juices likewiſe depraved. Thus the aliments lie long in the ſtomach; and if the viſcera were formerly free of obſtructions, they are now generated; the ſtrength fails; perſpiration and other excretions are obſtructed; the viſcid and pituitous humours produced by theſe kinds of food float about the præcordia, and increaſe the diſeaſe, while the ſurface of the body becomes quite dry. Nay, ſo much does this kind of diet conſpire with the diſeaſe, that 100 pounds of fluid will ſometimes be imbibed in a few days by hydropic perſons who take no drink. Even in health, if the body from any cauſe becomes dry, or deprived of a conſiderable part of its juices, as by hunger, labour, &c. it will imbibe a conſiderable quantity of moiſture from the air; ſo that we muſt impute the abovementioned extraordinary inhalation, in part at leaſt, to the denial of drink, and to the nature of the aliment given to the ſick. The following is the account given by Dr Milman of his practice in the Middleſex hoſpital.

If the patient be not very much debilitated, he is ſometimes treated with the purging waters, and a doſe of jalap and calomel alternately. On the intermediate days he gets a ſaline mixture, with 40 or 60 drops of *acetum ſcilliticum* every ſixth hour; drinking with the purgatives oat-gruel and ſome thin broths. That he might the better aſcertain what ſhare the liquids given along with the medicines had in producing a copious flow of urine, he ſometimes gave the medicines in the beginning of the diſtemper without allowing the drink: but though the ſwellings were uſually diminiſhed a little by the purgatives, the urine ſtill continued ſcanty, and the patients were greatly weakened. Fearing, therefore, leſt, by following this courſe, the ſtrength of the ſick might be too much reduced, he then began his courſe of diuretic medicines, giving large quantities of barley-water with a little *ſal diureticus*; by which means, ſometimes in the ſhort ſpace of 48 hours after the courſe was begun, the urine flowed out in very large quantity: but as ſaline drinks are very diſagreeable to the taſte, a drink was compoſed purpoſely for hydropic perſons, of half an ounce of cream of tartar diſſolved in two pounds of barley-water, made agreeably ſweet with ſyrup, adding one or two ounces of French brandy.

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To this compoſition Dr Milman was induced by the great praiſes given to cream of tartar by ſome phyſicians in hydropic caſes. In the *Acta Bononienſia*, 15 caſes of hydropic patients are narrated who were cured only by taking half an ounce of cream of tartar daily. But it is remarkable, that by theſe very patients the cream of tartar was taken for 20, 30, nay 40 days, often without any perceptible effect; yet when diſſolved in a large quantity of water, it ſhowed its ſalutary effects frequently within as many hours, by producing a plentiful flow of urine. This liquor is now the common drink of hydropic patients in the hoſpital abovementioned, of which they drink at pleaſure along with their medicines.

Among purgative medicines Dr Milman recommends the *radix ſenekæ*; but ſays the decoction of it, according to the Edinburgh Pharmacopœia, is too ſtrong, as he always found it excite vomiting when prepared as there directed, and thus greatly to diſtreſs the patients: but when only half an ounce or ſix drachms of the root are uſed to a pound of decoction, inſtead of a whole ounce as directed by the Edinburgh college, he finds it an excellent remedy; and though it may ſometimes induce a little vomiting, and frequently a nauſea, yet it ſeldom failed to procure nine or ten ſtools a-day, and ſometimes alſo proved diuretic. But we muſt take care not to be too free in the uſe of ſeneka, or any other purgative, if the patients be very weak; and therefore, after having uſed purgatives for ſome time, it will be proper to depend upon diuretics entirely for perfecting the cure; and of the ſucceſs of this method our author gives ſome very remarkable inſtances. But he obſerves, that after the dropſy is removed, the patient will ſometimes die without any evident cauſe; and of this it is proper that the phyſicians ſhould be aware. It is remarkable with what eaſe a flux of urine is induced in thoſe who have a ſcirrhous liver; while on the other hand, in one who had the meſenteric glands obſtructed, along with a ſcirrhoſity of the liver and vitiated ſtate of the lungs, the moſt powerful diuretics proved ineffectual. In ſome caſes Dr Milman thinks the kidneys may be ſo preſſed with the weight of the water, as to be unable to perform their office. With regard, however, to diuretics in general, it may be remarked, that the operation of none of them can be certainly depended upon. In particular conſtitutions, and at particular times, one will be

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be obſerved to ſucceed, after another, though commonly much more powerful, has been tried in vain. Accordingly various articles of this kind are often uſed in ſucceſſion. Recourſe is particularly often had to the roots of taraxacum, of colchicum, and of ſquills; the latter, eſpecially when combined with calomel, is often found to be a very powerful diuretic. And indeed mercury in different forms probably from acting as a deobſtruent, is often of very great uſe in dropſical complaints. Among other diuretics, the lactuca viroſa has of late been highly extolled by Dr Collins of Vienna, and the nicotiana tabaccum by Dr Fowler of York: but neither has been extenſively introduced into practice, although we have known ſome inſtances in which the latter has been uſed with great advantage.

The water having been drawn off, we are to put the patient on a courſe of ſtrengtheners; ſuch as the Peruvian bark, with ſome of the warm aromatics, and a due proportion of rhubarb infuſed in wine and chalybeates. Gentle exerciſe, and frictions on the belly, with ſuch a courſe of diet as ſhall be light and nouriſhing, are alſo to be enjoined: and it may be obſerved, that the uſe of tonic medicines is by no means to be delayed till a complete evacuation of the water can be obtained. On the contrary, by alternating, and even combining the uſe of evacuants and tonics, the influence of both is often very much promoted.

When the patient can by no other means be relieved, the operation of paracenteſis muſt be had recourſe to, which is deſcribed under the article SURGERY.

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GENUS LXXX. HYDROMETRA.
DROPSY of the *Uterus*.

Hydrometra, *Sauv.* gen. 289. *Sag.* 116. *Boerh.* 1224

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GENUS LXXXI. HYDROCELE.
DROPSY of the *Scrotum*.

Oſcheocele, *Sauv.* gen. 41. *Vog.* 388.
Oſcheophyma, *Sag.* 44.
Hydrops ſcroti, *Vog.* 389.
Hydrops teſtium, *Boerh.* 1227.

For the treatment of theſe two diſeaſes, we may refer the reader to what has already been ſaid of other ſpecies of dropſy particularly aſcites. But both are chiefly to be combated by chirurgical operation, eſpecially the latter, in which it ſeldom fails to produce a complete cure.

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GENUS LXXXII. PHYSCONIA.
SWELLING of the *Belly*.

Phyſconia, *Sauv.* gen. 283. *Vog.* 325. *Sag.* gen. 110.
Hypoſarca, *Lin.* 218.

This diſeaſe may ariſe from a variety of cauſes, as from a ſwelling of the liver, ſpleen, kidneys, uterus, omentum, ovarium, meſentery, inteſtines, &c. and ſometimes it ariſes merely from fat. In the former caſes, as the viſcera are generally ſcirrhous and indurated, the diſtemper is for the moſt part incurable; neither is the proſpect much better where the diſeaſe is occaſioned by a great quantity of fat.

Rachitis.

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GENUS LXXXIII. RACHITIS.
The RICKETS.

Rachitis, *Sauv.* gen. 294. *Lin.* 212. *Vog.* 318.
Sag. gen. 120. *Boerh.* 1480. *Hoffm.* III. 487.
Zeviani. della Rachitide. *Gliſſon.* de Rachitide.

Deſcription. This is one of the diſeaſes peculiar to infancy. It ſeldom attacks children till they are nine months, nor after they are two years old; but it frequently happens in the intermediate ſpace between theſe two periods. The diſeaſe ſhows itſelf by a flaccid tumor of the head and face, a looſe flabby ſkin, a ſwelling of the abdomen, and falling away of the other parts, eſpecially of the muſcles. There are protuberances of the epiphyſes of the joints; the jugular veins ſwell, while the reſt decreaſe; and the legs grow crooked. If the child has begun to walk before he be ſeized with this diſeaſe, there is a ſlowneſs, debility, and tottering in his motion, which ſoon brings on a conſtant deſire of ſitting, and afterwards of lying down; inſomuch that nothing at laſt is moveable but the neck and head. As they grow older, the head is greatly enlarged, with ample ſutures; the thorax is compreſſed on the ſides, and the ſternum riſes up ſharp, while the extremities of the ribs are knotty. The abdomen is protuberant, and the teeth black and carious. In ſuch patients as have died of this diſeaſe, all the ſolids appear ſoft and flaccid, and the fluids diſſolved and mucous,

Cauſes. The rickets may proceed from ſcrofulous or venereal taints in the parents, and may be increaſed by thoſe of the nurſe. It is likewiſe promoted by feeding the child with aqueous and mucous ſubſtances, crude ſummer-fruits, fiſh, unleavened farinaceous aliment, and too great a quantity of ſweet things.—Sometimes it follows intermittent fevers and chronic diſorders; and in ſhort is cauſed by any thing which tends to debilitate the body, and induce a viſcid and unhealthy ſtate of the juices.

Prognoſis. The rickets do not uſually prove fatal by themſelves, but if not cured in time, they make the perſon throughout life deformed in various ways; and often produce very pernicious diſorders, ſuch as carious bones in different parts of the body.

Cure. This is to be affected by mild cathartics, alteratives, and tonics, ſuch as are uſed in other diſeaſes attended with a debility of the ſyſtem and a vitiated ſtate of the blood and juices. In the Weſtern Iſlands of Scotland, the medicine uſed for the cure of the rickets is an oil extracted from the liver of the ſkate-fiſh. The method of application is as follows: Firſt, the wriſts and ankles are rubbed with the oil in the evening: this immediately raiſes a fever of ſeveral hours duration. When the fever from the firſt rubbing ſubſides, the ſame parts are rubbed again the night following; and repeatedly as long as the rubbing of theſe parts continues to excite the fever.—When no fever can be excited by rubbing the wriſts and ankles alone, they are rubbed again along with the knees and elbows. This increaſed unction brings on the fever again; and is practiſed as before, till it no longer has that effect. Then the vertebræ and ſides are rubbed, along with the former parts; and this unction, which again brings on the fever, is repeated as the former. When no fever can be any longer excited by this unction, a flannel ſhirt dipped in the oil is put upon the body of the patient: this brings on a more violent and ſenſible fever than any of the former unctions; and is continued till the cure be completed, which it commonly is in a ſhort time.

A German phyſician, Dr Strack, has lately publiſhed a paper, in which he recommends the filings of iron as a certain remedy in the rickets. This diſeaſe, he obſerves, in general begins with children when they are about 16 months old. It is ſeldom obſerved with children before they be one year old, and ſeldom attacks them after they paſs two; and it is very generally worſe where it begins early than where it begins late.

For effecting a cure, it is, he affirms, a matter of the utmoſt conſequence to be able to diſtinguiſh, very early, whether a child will be afflicted with rickets or not. And this, he aſſures us may be determined by the following ſymptoms; paleneſs and ſwelling of the countenance; and in that part of the cheeks which ſhould naturally be red, a yellow colour approaching to that of ſulphur. When that is the caſe, he directs that a medicine ſhould be immediately had recourſe to which will retard the further progreſs of the diſeaſe and remove what has already taken place. For this purpoſe, he adviſes that five grains of the filings of iron, and as much rhubarb, ſhould be rubbed up with ten grains of ſugar, and given for a doſe every morning faſting, and every evening an hour before ſupper. But if conſiderable looſeneſs ſhould be produced, it will be neceſſary, at firſt, to perſiſt in the uſe of one doſe only every day.

After a month's continuance in this courſe, according to Dr Strack, there in general enſues a keen appetite for food, quick digeſtion, and a copious flow of urine; by means of which the fulneſs of the face and yellowneſs of the complexion are by degrees removed, while the natural colour of the countenance and firmneſs of the body in general are gradually reſtored. This practice, he aſſures us, has never failed of ſucceſs in any one inſtance; not even in thoſe children born of parents greatly afflicted with the rickets.

In addition to the uſe of chalybeates, great benefit is often alſo obtained in this diſeaſe from the uſe of the cold bath; which, under prudent adminiſtration, is perhaps one of the moſt effectual remedies for this complaint with which we are yet acquainted.

When the bones of rickety children begin to bend, they may ſometimes be reſtored to their natural ſhape by compreſſes, bolſters, and proper ſupports. See the article SURGERY.

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ORDER III. IMPETIGINES.

Impetigines, *Sauv.* Cl. X. Ord. V. *Sag.* Cl. III. Ord. V.

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GENUS LXXXIV. SCROFULA.

KING'S-EVIL.

Scrofula, *Sauv.* gen. 285. *Vog.* 367. *Sag.* 121.
Struma, *Lin.* 284.

Scrofula.

Deſcription. This diſeaſe ſhows itſelf by hard, ſcirrhous, and often indolent tumors, which ariſe by degrees in the glands of the neck, under the chin, armpits, and different parts of the body, but moſt commonly in the neck, and behind the ears. In proceſs of time, the cellular ſubſtance, ligaments of the joints, and even the bones themſelves, are affected. In ſcrofula the ſwellings are much more moveable than thoſe of the ſcirrhous kind; they are generally ſofter, and ſeldom attended with much pain; they are tedious in coming to ſuppuration; are very apt to diſappear ſuddenly and again to riſe in ſome other part of the body. We may likewiſe mention as characteriſtic circumſtances of this diſeaſe, a remarkable ſoftneſs of the ſkin, a kind of fulneſs of the face, generally with large eyes, and a very delicate complexion.

Cauſes. A variety of cauſes have been mentioned as tending to produce ſcrofula; viz. a crude indigeſtible food; bad water; living in damp, low ſituations; its being an hereditary diſeaſe, and in ſome countries endemic, &c. But whatever may in different circumſtances be the exciting or prediſpoſing cauſes of the ſcrofula, the diſeaſe itſelf either depends upon, or is at leaſt much connected with, a debility of the conſtitution in general, and probably of the lymphatic ſyſtemin particular, the complaint always ſhowing itſelf by ſome affections of the latter. And that debility has at leaſt a conſiderable influence in its production is probable, not only from the manifeſt nature of ſome of the cauſes ſaid to be productive of ſcrofula, but likewiſe from ſuch remedies as are found moſt ſerviceable in the cure, which are all of a tonic invigorating nature.

Prognoſis. The ſcrofula is a diſtemper which often eludes the moſt powerful medicines, and therefore phyſicians cannot with any certainty promiſe a cure. It is ſeldom, however, that it proves mortal in a ſhort time, unleſs it attacks the internal parts, ſuch as the lungs, where it frequently produces tubercles that bring on a fatal conſumption. When it attacks the joints, it frequently produces ulcers, which continue for a long time, and gradually waſte the patient; while in the mean time the bones become foul and corroded and death enſues after a long ſcene of miſery. The prognoſis in this reſpect muſt be regulated entirely by the nature of the ſymptoms.

Cure. It was long ſuppoſed that ſcrofula depended upon an acid acrimony of the fluids; and this, it is probable, give riſe to the uſe of burnt ſponge, different kinds of ſoap, and other alkaline ſubſtances, as the beſt remedies for acidity. But although a ſourneſs in the ſtomach and *primæ viæ* does no doubt frequently occur in theſe complaints, yet this ſymptom ſeems to be entirely the conſequence of that general relaxation which in ſcrofula ſo univerſally prevails, and which does not render it in the leaſt neceſſary to ſuppoſe a general aceſcency of the fluids to take place; as the one very frequently, it is well known, even in other complaints occurs without the leaſt ſuſpicion of any acid acrimony exiſting after the other. This is alſo rendered very probable from the indolent nature of ſcrofulous tumors which have been known to ſubſiſt for years without giving any uneaſineſs; which could not have been the caſe, if an acid, or any other acrimony, had prevailed in them.

In the treatment of ſcrofula, different morbid conditions,

Impetigines

ditions, exiſting in different parts, require, according to circumſtances, various means of cure: but, upon the whole, the remedies directed may be conſidered as uſed with a view either to the tumors, to the ulcerations, or to the general ſtate of the ſyſtem.

Gentle mercurials are ſometimes of uſe as reſolvents in ſcrofulous ſwellings; but nothing has ſuch conſiderable influence as a frequent and copious uſe of Peruvian bark. Cold bathing too, eſpecially in the ſea together with frequent moderate exerciſe, is often of ſingular ſervice here; as is likewiſe change of air, eſpecially to a warm climate.

In the ſcrofulous inflammation of the eyes, or ophthalmia ſtrumoſa, the Peruvian bark has alſo been given with extraordinary advantage: and we meet with an inſtance of its having cured the gutta roſacea in the face; a complaint which it is often difficult to remove, and which is extremely diſagreeable to the fair ſex.

From the various caſes related of tumefied glands, it appears, that when the habit is relaxed and the circulation weak, either from conſtitution or accident, the bark is a moſt efficacious medicine, and that it acts as a reſolvent and diſcutient. It will not, however, ſucceed in all caſes; but there are few in which a trial can be attended with much detriment. Dr Fothergill obſerves, that he has never known it avail much where the bones were affected, nor where the ſcrofulous tumor was ſo ſituated as to be accompanied with much pain, as in the joints, or under the membranous coverings of the muſcles; for when the diſeaſe attacks thoſe parts, the perioſteum ſeldom eſcapes without ſome injury, by which the bone will of courſe be likewiſe affected. Here the Peruvian bark is of no effect: inſtead of leſſening, it rather encreaſes the fever that accompanies thoſe circumſtances: and if it do not really aggravate the complaint, it ſeems at leaſt to accelerate the progreſs of the diſeaſe.

Various are the modes in which the bark is adminiſtered: Dr Fothergill makes uſe of a decoction with the addition of ſome aromatic ingredients and a ſmall quantity of liquorice-root, as a form in which a ſufficient quantity may be given without exciting diſguſt. But where is it eaſily retained in the ſtomach in ſubſtance perhaps the beſt form of exhibiting it is that of powder; and in this ſtate it is often advantageouſly conjoined with powder of cicuta, an article poſſeſſing very great deobſtruent powers.

The powder, however, ſoon becomes diſagreeable to very young patients; and the extract ſeems not ſo much to be depended upon as may have been imagined. In making the extract, it is expoſed to ſo much heat, as muſt have ſome effect upon its virtues, perhaps to their detriment. In adminiſtering it, likewiſe, if great care be not taken to mix it intimately with a proper vehicle, or ſome very ſoluble ſubſtance, in weak bowels it very often purges, and thereby not only diſappoints the phyſician, but injures the patient. A ſmall quantity of the *cortex Winteranus* added gives the medicine a grateful warmth; and a little liquorice, a few raiſins, gum arabic, or the like added to the decoction before it be taken from the fire, by making the liquor viſcid enables it to ſuſpend more of the fine particles of the bark; by which proceſs the medicine is not only improved in efficacy, but at the ſame time rendered leſs diſagreeable.

Scrofula.

In indolent ſwellings of the glands from viſcid humours, ſea-water alſo has been ſtrongly recommended by Dr Ruſſel.

Dr Fothergill alſo acquaints us, that the cicuta even by itſelf is not without a conſiderable ſhare of efficacy in removing ſcrofulous diſorders. He mentions the caſe of a gentlewoman, about 28 years of age, afflicted from her infancy with ſcrofulous complaints, ſevere ophthalmies, glandular ſwellings, &c. cured by the *extractum cicutæ* taken conſtantly for the ſpace of a year. He obſerves, however, that when given to children even in very ſmall doſes, it is apt to produce ſpaſmodic affections; for which reaſon he rarely exhibits it to them when very young, or even to adults of very irritable habits.

Dr Fothergill gives ſeveral other inſtances of the ſucceſs of cicuta in ſcrofulous caſes, and even in one which ſeemed to be not far removed from a confirmed phthiſis; but owns that it ſeldom had ſuch good effects afterwards: yet he is of opinion, that where there are ſymptoms of tubercles forming, a ſtrumous habit, and a tendency to phthiſis, the cicuta will often be ſerviceable. It is anodyne, corrects acrimony, and promotes the formation of good matter. With regard to the quality of the medicine, he obſerves, that the extract prepared from hemlock before the plant arrives at maturity, is much inferior to that which is made when the hemlock has acquired its full vigour, and is rather on the verge of decline: juſt when the flowers fade, the rudiments of the ſeeds become obſervable, and the habit of the plant inclines to yellow. This, he thinks, is the proper time to collect the hemlock. It has then had the full benefit of the ſummer heat; and the plants that grow in expoſed places will generally be found more active than thoſe that grow in the ſhade. The leſs heat it undergoes during the preparation, the better. Therefore, if a conſiderable quantity of the dry powder of the plant gathered at a proper ſeaſon be added, leſs boiling will be neceſſary, and the medicine will be the more efficacious. But let the extract be prepared in what manner ſoever it may, provided it be made from the genuine plant, at a proper ſeaſon, and be not deſtroyed by boiling, the chief difference obſervable in uſing it is, that a larger quantity of one kind is required to produce a certain effect than of another. Twenty grains of one ſort of extract have been found equal in point of efficacy to thirty, nay near forty, of another; yet both of them made from the genuine plant, and moſt probably prepared with equal fidelity. To prevent the inconveniences ariſing from this uncertainty, it ſeems always expedient to begin with ſmall doſes, and proceed ſtep by ſtep till the extract produces certain effects, which ſeldom fail to ariſe from a full doſe. Theſe effects are different in different conſtitutions. But, for the moſt part, a giddineſs affecting the head, and motions of the eyes as if ſomething puſhed them outwards, are firſt felt; a ſlight ſickneſs, and trembling agitation of the body; a laxative ſtool or two. One or all theſe ſymptoms are the marks of a full doſe, let the quantity in weight be what it will. Here we muſt ſtop till none of theſe effects be felt; and in three or four days advance a few grains more. For it has been ſuppoſed by moſt of thoſe who have uſed this medicine to any good purpoſe, that the cicuta ſeldom procures any benefit, though given for a long time, unleſs in as large a doſe as the patient can bear without ſuffering any of the inconveniences abovementioned. There is, however, reaſon to believe, that its effects as a diſcutient are in no degree dependent on its narcotic powers: and we are inclined to think, that recourſe is often had to larger doſes than are neceſſary; or at leaſt that the ſame benefit might be derived from ſmaller ones continued for an equal length of time.

Patients commonly bear a greater quantity of the extract at night than at noon, and at noon than in the morning. Two drachms may be divided into thirty pills. Adults begin with two in the morning, two at noon, and three or four at night, with directions to increaſe each doſe, by the addition of a pill to each, as they can bear it.

But after all, the beſt form under which the cicuta can, we think, be exhibited, is that of powder from the leaves. This, either in a ſtate of powder or made into pills, may be given at firſt to the extent of four or five grains, and the doſe gradually riſing till it amount to 15 or 20 grains twice or thrice a day. Given to this extent, particularly when conjoined with the Peruvian bark, it has often been found of great ſervice in ſcrofulous caſes. At the ſame time it muſt be allowed, that ſuch patients, after reſiſting every mode of cure, will have in ſome inſtances a ſpontaneous recovery in the progreſs of life, probably from the ſyſtem acquiring additional vigour.

350 Genus LXXV. SYPHILIS.

Lues Venerea, or *French Pox.*

Syphilis, *Sauv.* gen. 3086. *Lin.* 6. *Vog.* 319. *Sag.* 126.

Lues venerea, *Boerh.* 1440. *Hoffm.* III. 413. *Junck.* 96. *Aſtruc* de lue Venerea.

Dr Aſtruc, who writes a very accurate hiſtory of the lues venerea, is fully convinced that it is a new diſeaſe, which never appeared in Europe till ſome time between the years 1494 and 1496, having been imported from America by the companions of Chriſtopher Columbus; though this opinion is not without its opponents. Dr Sanches in particular has contended with much learning and ability, that it appeared in Europe at an earlier period: But it is at leaſt certain, that it was altogether unknown to the medical practitioners of Greece and Rome, and that it was a very common diſeaſe in America when the Europeans firſt viſited that country. But at whatever period it may have been introduced into Europe, or from whatever ſource it may have been obtained, there can be no doubt that, as well as ſmall-pox or meaſles, ſyphilis depends on a peculiar ſpecific contagion; or a matter *ſui generis* which is alone capable of inducing this diſeaſe.

The venereal infection, however, cannot, like the contagious miaſmata of the ſmall-pox and ſome other diſeaſes, be carried through the air, and thus ſpread from place to place: for unleſs it is tranſmitted from the parents to the children, there is no other way of contracting the diſeaſe but from actual contact with the infectious matter. Thus, when a nurſe happens to labour under the diſeaſe, the infant that ſhe ſuckles will receive the infection; as on the other hand, when the child is infected, the nurſe is liable to receive it: and there have even been inſtances known of lying-in women being infected very violently, from having employed a perſon to draw their breaſts who happened to have venereal ulcers in the throat. It may be caught by touching venereal ſores if the cuticle be abraded or torn; and in this way accoucheurs and midwives have ſometimes been infected ſeverely. Dr Macbride ſays, the moſt inveterate pox he ever ſaw was caught by a midwife, who happened to have a whitelow on one of her fingers when ſhe delivered a woman ill of the lues venerea.

But by far the moſt ready way of contracting this diſeaſe is by coition, the genital parts being much more bibulous than the reſt of the body. When the diſorder is communicated, the places where the morbific matter enters are generally thoſe where it firſt makes its appearance; and as coition is the moſt uſual way of contracting it, ſo the firſt ſymptoms commonly appear on or near the pudenda.

The patient's own account will, for the moſt part, help us to diſtinguiſh the diſeaſe: but there are ſometimes caſes wherein we cannot avail ourſelves of this information, and where inſtead of confeſſing, the parties ſhall conceal all circumſtances; while, on the other hand, there are now and then people to be met with, who perſuade themſelves that ſymptoms are venereal, which in reality are owing to ſome other cauſe: and therefore it is of the utmoſt importance to inform ourſelves thoroughly of the nature of thoſe ſymptoms and appearances which may be conſidered as pathognomic ſigns of lues venerea.

In the firſt place, when we find that the local ſymptoms, ſuch as chancres, buboes, phymoſis, and the like, do not give way to the uſual methods; or when theſe complaints, after having been cured, break out again without a freſh infection; we may juſtly ſuſpect that the virus has entered the whole maſs of fluids: but if at the ſame time ulcers break out in the throat, and the face is deformed by callous tubercles, covered with a brown or yellow ſcab, we may be aſſured that the caſe is now become a confirmed lues, which will require a mercurial courſe.

When eruptions of the furfuraceous and ſuperficial kind are venereal, they are not attended with itching; and the ſcale being picked off, the ſkin appears of a reddiſh brown or rather copper-colour, underneath; whereas leprous eruptions are itchy, throw off a greater quantity of ſcales, and riſe in greater blotches, eſpecially about the joints of the knees and elbows. Venereal tubercles or puſtules are eaſily diſtinguiſhed from carbuncles of the face, by not occupying the cheeks or the noſe, nor as having a purulent apex, but are covered at top, either with a dry branny ſcruf like the ſuperficial eruptions juſt now mentioned, or elſe with a hard dry ſcab of a tawney yellow hue; they particularly break out among the hair or near to it, on the forehead or on the temples.

Venereal ulcers affecting the mouth are diſtinguiſhable from thoſe which are ſcorbutic in the following manner: 1. Venereal ulcers firſt affect the tonſils, fauces, and uvula; then the gums but theſe very rarely: on the contrary, ſcorbutic ulcers affect the gums firſt of all; then the fauces, tonſils, and uvula. 2. Venereal ulcers frequently ſpread to the noſe; ſcorbutic ones almoſt never. 3. Venereal ulcers are callous in the edges; ſcorbutic ones are not ſo. 4. Venereal ulcers are circumſcribed, and, for the moſt part, are circular, at leaſt they are confined to certain places; ſcorbutic ones are of a more irregular form, ſpread wider, and frequently affect the whole mouth. 5. Venereal ulcers are for the moſt part hollow, and generally covered at bottom with a white or yellow ſlough; but ſcorbutic ones are more apt to grow up into looſe fungi. 6. Venereal ulcers are red in their circumference, but ſcorbutic ones are always livid. 7. Venereal ulcers frequently rot the ſubjacent bones, the ſcorbutic ones ſeldom or never. 8. And laſtly, Venereal ulcers are moſtly combined with other ſymptoms which are known to be venereal; ſcorbutic ones with the diſtinguiſhing ſigns of the ſcurvy, ſuch as difficult breathing, liſtleſſneſs, ſwelling of the legs, rotten gums, &c.

Another ſure ſign of the confirmed lues is often afforded from certain deep-ſeated nocturnal pains, particularly of the ſhins, arms, and head. As for any ſuperficial wandering pains that have no fixed ſeat, and which affect the membranes of the muſcles and ligaments of the joints, they, for they moſt part, will be found to belong to the gout or rheumatiſm, and can never be conſidered as venereal unleſs accompanied with ſome other evident ſigns; but with regard to the pains that are deeply ſeated, and always fixed to the ſame place, and which affect the middle and more ſolid part of the ulna, tibia, and bones of the cranium, and rage chiefly and with greateſt violence in the fore-part of the night, ſo that the patient can get no reſt till morning approaches, theſe may ſerve to convince us that the diſeaſe has ſpread itſelf throughout the whole habit, whether they be accompanied with other ſymptoms of the lues or not. *Gummata* in the fleſhy parts, *nodes* in the perioſteum, *ganglia* upon the tendons, *tophi* upon the ligaments, *exoſtoſes* upon the bones, and *fici* at the verge of the anus, are all of them ſigns of the confirmed lues: theſe are hard indolent ſwellings; but as they ſometimes ariſe independently of any venereal infection, and perhaps may proceed from a ſcrofulous taint, unleſs they be accompanied or have been proceded by ſome of the more certain and evident ſymptoms of the lues, we muſt be cautious about pronouncing them venereal. When theſe ſwellings are not owing to the ſyphilitic virus, they are very ſeldom painful, or tend to inflame and ſuppurate; whereas thoſe that are venereal uſually do, and if they lie upon a bone generally bring on a caries.

Theſe carious ulcers are moſt commonly met with upon the ulna, tibia, and bones of the cranium; and when accompanied with nocturnal pains, we can never heſitate about declaring their genuine nature. Frequent abortions, or the excluſion of ſcabby, ulcerated, half-rotten, and dead fetuſes, happening without any manifeſt cauſe to diſturb the fetus before its time, or to deſtroy it in the womb, may be reckoned as a ſure ſign that at leaſt one of the parents is infected.

Theſe then are the principal and moſt evident ſigns of the confirmed lues. There are others which are more equivocal, and which unleſs we can fairly trace them back to ſome that are more certain, cannot be held as ſigns of the venereal diſeaſe: Such are, 1. Obſtinate inflammations of the eyes, frequently returning with great heat, itching, and ulceration of the eye-lids. 2. A ſinging and hiſſing noiſe in the ears, with ulcers or caries in the bones of the meatus auditorius. 3. Obſtinate head-achs. 4. Obſtinate cutaneous eruptions, of the itchy or leprous appearance, not yielding to the milder methods of treatment. 5. Swellings of the bones; and, 6. Wandering and obſtinate pains. None of theſe ſymptoms, however, can be known to be venereal, except they happen to coincide with ſome one or other of the more certain ſigns.

It may, perhaps, be conſidered as a ſingularity in this diſeaſe, that the diagnoſis is often more difficult in the advanced than in the early periods of the affection. That is, with thoſe who have been certainly ſubjected to ſyphilis, it is often very difficult to ſay whether certain ſymptoms, remaining after the ordinary modes of cure have been employed, be ſyphilitic or not. Very frequently, as appears from the ſequel, nocturnal pains, ulcerations, and the like, remaining after a long courſe of mercury has been employed, are in no degree of a venereal nature, but are in reality to be conſidered as conſequences rather of the remedy than of the diſeaſe; and are accordingly beſt removed by nouriſhing diet, gentle exerciſe, and tonics. But as long as any ſymptoms of any kind remain, it is often impoſſible to convince ſome patients that they are cured; and it is often impoſſible for a phyſician with certainty to affirm that the diſeaſe is altogether overcome.

Upon the whole, we are firſt to diſtinguiſh and conſider the ſeveral ſymptoms apart; and then, by comparing them with each other, a clear judgment may be formed upon the general review.

Prognoſis. Being thoroughly convinced that the caſe is venereal, we are to conſider, firſt of all, whether it be of a longer or ſhorter date; for the more recent it is, it will, *cæteris paribus*, be leſs difficult to remove. But there are other circumſtances which will aſſiſt us in forming a prognoſtic as to the event. As,

1. The age of the patient. This diſorder is more dangerous to infants and old people than to ſuch as are in the flower and vigour of life, in whom ſome part of the virus may be expelled by exerciſe, or may be ſubdued in ſome degree by the ſtrength of the conſtitution.

2. The ſex. Though women are for the moſt part weaker than men, and therefore ſhould ſeem leſs able to reſiſt the force of any diſeaſe, yet experience ſhows that this is eaſier borne by them than by men; perhaps owing to the menſtrual and other uterine diſcharges, by which a good ſhare of the virus may be carried off immediately from the parts where it was firſt applied; for it is obſervable, that whenever theſe diſcharges are obſtructed, or ceaſe by the ordinary courſe of nature, all the ſymptoms of this diſeaſe grow worſe.

3. The habit of body. Perſons who have acrid juices will be liable to ſuffer more from the venereal poiſon than ſuch as have their blood in a milder ſtate; hence, when people of a ſcorbutic or ſcrofulous habit contract venereal diſorders, the ſymptoms are always remarkably violent, and difficult to cure. And for the ſame reaſons, the confirmed lues is much more to be dreaded in a perſon already inclined to an aſthma, phthiſis, dropſy, gout, or any other chronic diſtem-

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per, than in one of a ſound and healthy conſtitution. For as the original diſeaſe is increaſed by the acceſſion of the venereal poiſon, ſo the lues is aggravated by being joined to an old diſorder. The more numerous the ſymptoms, and the more they affect the bones, the more difficult the cure. Of all combinations the union of ſyphilis with ſcrofula is perhaps the moſt difficult to overcome: but if the acrimony ſhould ſeize on the nobler internal parts, ſuch as the brain, the lungs, or the liver, then the diſeaſe becomes incurable, and the patient will either go off ſuddenly in an apoplectic fit or ſink under a conſumption.

Cure. Viewing this diſeaſe as depending on a peculiar contagious matter introduced into the ſyſtem, and multiplied there, it is poſſible to conceive that a cure may be obtained on one of three principles; either by the evacuation of the matter from the ſyſtem, by the deſtruction of its activity, or by counteracting its influence in the ſyſtem. It is not impoſſible that articles exiſt in nature capable of removing this complaint on each of theſe grounds: but we may venture at leaſt to aſſert, that few ſuch are yet diſcovered. Notwithſtanding numbers of pretended infallible remedies, for ſyphilis, mercury is perhaps the only article on which dependence is placed among European practitioners; and with regard to its mode of operation, all the three different opinions pointed out have been adopted and ſupported by different theoriſts.—But although many ingenious arguments have been employed in ſupport of each, we are, upon the whole, inclined to think it more probable thatmercury operates by deſtroying the activity of the venereal virus, than that it has effect either by evacuating it, or by exciting a ſtate of action, by which its influence is counteracted. Some practitioners have affirmed, that the diſeaſe may be totally extirpated without the uſe of mercury: but, excepting in ſlight caſes, it appears from the moſt accurate obſervations, that this grand ſpecific is indiſpenſable; whether it be introduced through the pores of the ſkin, in the form of ointments, plaſters, waſhes, &c.; or given by the mouth, diſguiſed in the different ſhapes of pills troches, powders or ſolutions.

Formerly it was held as a rule, that a ſalivation ought to be raiſed, and a great diſcharge excited. But this is now found to be unneceſſary: for as mercury probably acts by ſome ſpecific power in ſubduing and correcting the venereal virus, all that is required is to throw in a ſufficient quantity of the medicine for this purpoſe; and if it can be diverted from the ſalivary glands ſo much the better, ſince the inconveniences attending a ſpitting are ſuch as we ſhould always wiſh to avoid.

Mecrury, when combined with any ſaline ſubſtance, has its activity prodigiouſly increaſed; hence the great variety of chemical preparations which have been contrived to unite it with different acids.

Corroſive ſublimate is one of the moſt active of all the mercurial preparations, inſomuch as to become a poiſon even in very ſmall doſes. It therefore cannot ſafely be given in ſubſtance; but muſt be diſſolved in order to render it capable of a more minute diviſion. We may ſee, by looking into Wiſeman, that this is an old medicine, though ſeldom given by regular practitioners. How it came to be introduced into ſo remote a part of the world as Siberia, is not eaſily found out; but Dr Clerc, author of the *Hiſtoire Naturelle de l'Homme Malade*, aſſures us, that the ſublimate ſolution has been of uſe there time out of mind.

Syphilis.

It appears to have been totally forgotten in other places, until of late years, when the baron Van Swieten brought it into vogue; ſo that at one period, if we credit Dr Locher, they uſed no other mercurial preparation at Vienna. The number of patients cured by this remedy alone in the hoſpital of St Mark, which is under the care of this gentleman, from 1754 to 1771 incluſive, being 4880.

The way to prepare the ſolution is, to diſſolve as much ſublimate in any kind of ardent ſpirit (at Vienna they uſe only corn-brandy) as will give half a grain to an ounce of ſolution. The doſe to a grown perſon is one ſpoonful mixed with a pint of any light ptiſan or barley-water, and this to be taken morning and evening: the patients ſhould keep moſtly in a warm chamber, and lie in bed to ſweat after taking the medicine: their diet ſhould be light; and they ought to drink plentifully throughout the day, of whey, ptiſan, or barley-water. If the ſolution does not keep the belly open, a mild purge muſt be given from time to time; for Locher obſerves, that thoſe whom it purges two or three times a-day, get well ſooner than thoſe whom it does not purge: he alſo ſays, that it very ſeldom affects the mouth, but that it promotes the urinary and cutaneous diſcharges. This courſe is not only to be continued till all the ſymptoms diſappear, but for ſome weeks longer. The ſhorteſt time in which Locher uſed to let the patients out was ſix weeks; and they were continued on a courſe of decoction of the woods for ſome weeks after they left off the ſolution.

This method has been introduced both in Britain and Ireland, though by no means to the excluſion of others; but it appears, that the ſolution does not turn out ſo infallible a remedy, either in theſe kingdoms, or in France, as they ſay it has done in Germany. It was ſeldom if ever found to perform a radical cure, and the frequent uſe of it proved in many caſes highly prejudicial. It has therefore been ſucceeded in practice, even at Vienna, by mercury exhibited in other forms; and, among theſe, by a remedy firſt recommended by Dr Plenck, and ſince improved by Dr Saunders; conſiſting of mercury united with mucilage of gum arabic, which is ſaid to render its exhibition perfectly mild and ſafe. For particulars, we refer to Dr Saunders's treatiſe.

But a late French writer, ſuppoſed to be Dr Petit, in a ſmall book, intitled *A parallel of the different methods of treating the venereal diſeaſe*, inſiſts, that there is neither certainty nor ſafety in any other method than the repeated frictions with mercurial ointment.

If therefore it is determined to have recourſe to the mercurial frictions, the patient may with advantage be prepared by going into the warm bath ſome days ſucceſſively; having been previouſly blooded if of a plethoric habit, and taking a doſe or two of ſome proper cathartic.

The patient being fitted with the neceſſary apparatus of flannels, is then to enter on the courſe.

If the perſon be of a robuſt habit, and in the prime of life, we may begin with two drachms of the *unguentum hydrargyri fortius*, (Ph. Lond.) which is to be rubbed in about the ankles by an aſſiſtant whoſe hands are covered with bladders: then having intermitted a day, we may expend two drachms more of the ointment, and reſt for two days; after which, if no ſoreneſs of the mouth comes on, uſe only one drachm; and at every ſubſequent friction aſcend till the ointment ſhall reach the trunk of the body; after which the rubbings are to be begun at the wriſts, and from thence gradually extended to the ſhoulders. In order to prevent the mercury from laying too much hold of the mouth, it muſt be diverted to the ſkin, by keeping the patient in a conſtant perſpiration from the warmth of the room, and by drinking plentifully of barley-water, whey, or ptiſan; but if, nevertheleſs, the mercury ſhould tend to raiſe a ſpitting, then, from time to time, we are either to give ſome gentle cathartic, or order the patient into a vapour or warm bath: and thus we are to go on, rubbing in a drachm of the ointment every ſecond, third, or fourth night, according as it may be found to operate; and on the intermediate days either purging or bathing, unleſs we ſhould chooſe to let the ſalivation come on; which, however it is much better to avoid, as we ſhall thus be able to throw in a larger quantity of mercury.

It is impoſſible to aſcertain the quantity of mercury that may be neceſſary to be rubbed in, as this will vary according to circumſtances; but we are always to continue the frictions for a fortnight at leaſt, after all ſymptoms of the diſeaſe ſhall have totally diſappeared; and when we have done with the mercury, warm bathing aud ſudorific decoctions of the woods, are to be continued for ſome time longer.

This is a general ſketch of the methods of treatment for the confirmed lues; but for a complete hiſtory of the diſeaſe, and for ample directions in every ſituation, we refer to Aſtruc, and his abridger Dr Chapman.—We have to add, however, that a method of curing this diſeaſe by fumigation has been lately recommended in France; but it ſeems not to meet with great encouragement. One of the moſt recent propoſals for the cure of the venereal diſeaſe is that of Mr Clare, and conſiſts in rubbing a ſmall quantity of mercury under the form of *mercurius muriatus mitius*, or *calomel* as it is commonly called, on the inſide of the cheek; by which means it has been ſuppoſed that we will not only avoid the inconveniences of unction, but alſo the purgative effects that are often produced by this medicine when taken into the ſtomach. But after all, the introduction of mercury under the form of unction, as recommended by the lateſt and beſt writers in Britain on the venereal diſeaſe, Dr Swediaur, Mr John Hunter, and others, is ſtill very generally preferred in Britain to any mode that has yet been propoſed.

Where, after a long trial of mercury, diſtreſſing ſymptoms ſtill remain, particularly obſtinate ulcerations and ſevere pains, benefit has often been derived from the uſe of opium: but there is little reaſon to believe, as has been held by ſome, that of itſelf it affords an infallible cure of this diſeaſe; at leaſt we are inclined to think, that all the facts hitherto brought in ſupport of the cure of ſyphilis by opium are at the utmoſt very doubtful.

In obſtinate ulcerations, remaining probably after the venereal virus has been overcome, and reſiſting the uſe of mercury, a complete cure has in many inſtances been obtained from the uſe of the root of the mezereon, the daphne mezereum of Linnæus. This article has been chiefly employed under the form of decoction; and it now appears that it is the baſis of an article at one time highly celebrated in venereal complaints, under the title of *Liſbon diet-drink*. But, upon the whole, theſe ſequelæ of this diſeaſe are perhaps more readily overcome by country air, gentle exerciſe and nouriſhing diet, particularly a milk diet, than by the uſe of any medicine whatever. It muſt indeed be allowed, that for combating different ſequelæ, various practices accommodated to the nature of theſe will on particular occaſions be requiſite. But into the conſideration of theſe we cannot here propoſe to enter.

Genus LXXXVI. SCORBUTUS. 351

Scurvy.

Scorbutus, *Sauv.* gen. 391. *Lin.* 223. *Vog.* 318. *Sag.* 127. *Boerh.* 1148. *Hoffm.* III. 369. *Junck.* 91. *Lind* on the Scurvy. *Hulme* de Scorbuto. *Rouppe* de morbis Navigantium.

Deſcription. The firſt indication of the ſcorbutic diatheſis is generally a change of colour in the face, from the natural and healthy look to a pale and bloated complexion, with a liſtleſſneſs, and averſion from every ſort of exerciſe; the gums ſoon after become itchy, ſwell, and are apt to bleed on the ſlighteſt touch; the breath grows offenſive; and the gums, ſwelling daily more and more, turn livid, and at length become extremely fungous and putrid, as being continually in contact with the external air; which in every caſe favours the putrefaction of ſubſtances diſpoſed to run into that ſtate, and indeed is abſolutely requiſite for the production of actual rottenneſs.

The ſymptoms of the ſcurvy, like thoſe of every other diſeaſe, are ſomewhat different in different ſubjects, according to the various circumſtances of conſtitution; and they do not always proceed in the ſame regular courſe in every patient. But what is very remarkable in this diſeaſe, notwithſtanding the various and immenſe load of diſtreſs under which the patients labour, there is no ſickneſs at the ſtomach, the appetite keeps up, and the ſenſes remain entire almoſt to the very laſt: when lying at reſt, they make no complaints, and feel little diſtreſs or pain; but the moment they attempt to riſe or ſtir themſelves, then the breathing becomes difficult, with a kind of ſtraitneſs or catching, and great oppreſſion, and ſometimes they have been known to fall into a ſyncope. This catching of the breath upon motion, with the loſs of ſtrength, dejection of ſpirit, and rotten gums, are held as the eſſential or diſtinguiſhing ſymptoms of the diſeaſe. The ſkin is generally dry, except in the very laſt ſtage, when the patients become exceedingly ſubject to faintings, and then it grows clammy and moiſt: in ſome it has an anſerine appearance; but much oftener it is ſmooth and ſhining; and, when examined, is found to be ſpread over with ſpots not riſing above the ſurface, of a rediſh, bluiſh, livid, or purple colour, with

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a ſort of yellow rim round them. At firſt theſe ſpots are for the moſt part ſmall, but in time they increaſe to large blotches. The legs and thighs are the places where they are principally ſeen: more rarely on the head and face. Many have a ſwelling of the legs, which is harder, and retains the impreſſion of the finger longer than the common dropſical or truly œdematous ſwellings. The ſlighteſt wounds and bruiſes, in ſcorbutic habits, degenerate into foul and untoward ulcers. And the appearance of theſe ulcers is ſo ſingular and uniform, that they are eaſily diſtinguiſhed from all others. Scorbutic ulcers afford no good digeſtion, but give out a thin and fetid ichor mixed with blood, which at length has the appearance of coagulated gore lying caked on the ſurface of the ſore, not to be ſeparated or wiped off without ſome difficulty. The fleſh underneath theſe ſloughs feels to the probe ſoft and ſpongy, and is very putrid. Neither detergents nor eſcharotics are here of any ſervice; for though ſuch ſloughs be with great pains taken away, they are found again at the next dreſſing, where the ſame ſanguineous putrid appearance always preſents itſelf. Their edges are generally of a livid colour, and puffed up with excreſcences of proud fleſh ariſing from below the ſkin. As the violence of the diſeaſe increaſes, the ulcers ſhoot out a ſoft bloody fungus, which often riſes in a night's time to a monſtrous ſize; and although deſtroyed by cauteries, actual or potential, or cut away with the knife, is found at next dreſſing as large as ever. It is a conſiderable time, however, before theſe ulcers, bad as they are, come to affect the bones with rottenneſs.—Theſe appearances will always ſerve to aſſure us that an ulcer is ſcorbutic; and ſhould put us on our guard with reſpect to the giving mercurials, which are the moſt pernicious things that can be adminiſtered in theſe caſes.

Scorbutic people, as the diſeaſe advances are ſeldom free from pains; though they have not the ſame ſeat in all, and often in the ſame perſon ſhift their place. Some complain of univerſal pain in all their bones; but moſt violent in the limbs, and eſpecially the joints: the moſt frequent ſeat of their pain, however, is ſome part of the breaſt. The pains of this diſeaſe ſeem to ariſe from the diſtraction of the ſenſible fibres by the extravaſated blood being forced into the interſtices of the perioſteum and of the tendinous and ligamentous parts; whoſe texture being ſo firm, the fibres are liable to higher degrees of tenſion, and conſequently of pain.

The ſtates of the bowels are various: in ſome there is an obſtinate coſtiveneſs; in others a tendency to a flux, with extremely fetid ſtools: the urine is alſo rank and fetid, generally high-coloured; and, when it has ſtood for ſome hours, throws up an oily ſcum on the ſurface. The pulſe is variable; but moſt commonly ſlower and more feeble than in the time of perfect health. A ſtiffneſs in the tendons, and weakneſs in the joints of the knees, appear early in the diſeaſe: but as it grows more inveterate, the patients generally loſe the uſe of their limbs altogether; having a contraction of the flexor-tendons in the ham, with a ſwelling and pain in the joint of the knee. Some have their legs monſtrouſly ſwelled, and covered over with livid ſpots or ecchymoſes; others have had tumors there; ſome, though without ſwelling, have the calves of the legs and the fleſh of the thighs quite indurated. As perſons far gone in the ſcurvy are apt to faint, and even expire, on being moved and brought out into the freſh air, the utmoſt care and circumſpection are requiſite when it is neceſſary to ſtir or remove them.

Scorbutus.

Scorbutic patients are at all times, but more eſpecially as the diſeaſe advances, extremely ſubject to profuſe bleedings from different parts of the body; as from the noſe, gums, inteſtines, lungs, &c. and likewiſe from their ulcers, which generally bleed plentifully if the fungus be cut away. It is not eaſy to conceive a more diſmal and diverſified ſcene of miſery than what is beheld in the third and laſt ſtage of this diſtemper; it being then that the anomalous and more extraordinary ſymptoms appear, ſuch as the burſting out of old wounds, and the diſſolution of old fractures that have been long united.

Cauſes. The term *ſcurvy* has been indiſcriminately applied, even by phyſicians, to almoſt all the different kinds of cutaneous foulneſs; owing to ſome writers of the laſt century, who comprehended ſuch a variety of ſymptoms under this denomination, that there are few chronic diſtempers which may not be ſo called, according to their ſcheme: but the diſeaſe here meant is the true putrid ſcurvy, ſo often fatal to ſeamen, and to people pent up in garriſons without ſufficient ſupplies of ſound animal-food and freſh vegetables; or which is ſometimes known to be endemic in certain countries, where the nature of the ſoil, the general ſtate of the atmoſphere, and the common courſe of diet, all combine in producing that ſingular ſpecies of corruption in the maſs of blood which conſtitutes this diſeaſe; for the appearances, on diſſecting ſcorbutic ſubjects, ſufficiently ſhow that the ſcurvy may, with great propriety, be termed a diſeaſe of the blood.

Dr Lind has, in a poſtſcript to the third edition of his treatiſe on the ſcurvy, given the reſult of his obſervations drawn from the diſſection of a conſiderable number of victims to this fatal malady, from which it appears that the true ſcorbutic ſtate, in an advanced ſtage of the diſtemper, conſiſts in numerous effuſions of blood into the cellular interſtices of moſt parts of the body, ſuperficial as well as internal; particularly the gums and the legs; the texture of the former being almoſt entirely cellular, and the generally dependent ſtate of the latter rendering theſe parts, of all others in the whole body, the moſt apt to receive, and retain the ſtagnant blood, when its craſis comes to be deſtroyed; and it loſes that glutinous quality which, during health, hinders it from eſcaping thro' the pores in the coats of the blood-veſſels or through exhalant extremities.

A dropſical indiſpoſition, eſpecially in the legs and breaſt, was frequently, but not always, obſerved in the ſubjects that were opened, and the pericardium was ſometimes found diſtended with water: the water thus collected was often ſo ſharp as to ſhrivel the hands of the diſſector; and in ſome inſtances, where the ſkin happened to be broken, it irritated and feſtered the wound.

The fleſhy fibres were found ſo extremely lax and tender, and the bellies of the muſcles in the legs and thighs ſo ſtuffed with the effuſed ſtagnating blood, that it was always difficult, and ſometimes impoſſible, to raiſe or ſeparate one muſcle from another. He ſays that the quantity of this effuſed blood was amazing; in ſome bodies it ſeemed that almoſt a fourth part of the whole maſs had eſcaped from the veſſels; and it often lay in large concretions on the perioſteum, and in ſome few inſtances under this membrane immediately on the bone. And yet, notwithſtanding this diſſolved and depraved ſtate of the external fleſhy parts, the brain always appeared perfectly ſound, and the viſcera of the abdomen, as well as thoſe in the thorax, were in general found quite uncorrupted. There were ſpots indeed, from extravaſated blood, obſerved on the meſentery, inteſtines, ſtomach, and omentum; but theſe ſpots were firm, and free from any mortified taint; and, more than once, an effuſion of blood as large as a hand's breadth, has been ſeen on the ſurface of the ſtomach; and what was remarkable, that very ſubject was not known while living to have made any complaint of ſickneſs, pain, or other diſorder, in either ſtomach or bowels.

Theſe circumſtances and appearances, with many others that are not here enumerated, all prove to a demonſtration a putreſcent, or at leaſt a highly depraved ſtate of the blood: and yet Dr Lind takes no ſmall pains to combat the idea of the ſcurvy's proceeding from animal putrefaction; a notion which, according to him, "may, and hath miſled phyſicians to propoſe and adminiſter remedies for it altogether ineffectual."

He alſo, in the preface to his third edition, talks of the miſchief done by an attachment to deluſive theories. He ſays, "it is not probable that a remedy for the ſcurvy will ever be diſcovered from a preconceived hypotheſis, or by ſpeculative men in the cloſet, who have never ſeen the diſeaſe, or who have ſeen at moſt only a few caſes of it;" and adds, "that though a few partial facts and obſervations may, for a little, flatter with hopes of greater ſucceſs, yet more enlarged experience muſt ever evince the fallacy of all poſitive aſſertions in the healing art."

Sir John Pringle, however, is of a very different opinion. He "is perſuaded, after long reflection, and the opportunities he has had of converſing with thoſe who to much ſagacity had joined no ſmall experience in nautical practice, that upon an examination of the ſeveral articles which have either been of old approved, or have of late been introduced into the navy, it will appear, that though theſe means may vary in form and in mode of operating, yet they all ſome way contribute towards preventing putrefaction; whether of the air in the cloſer parts of a ſhip, of the meats, of the water, of the clothes and bedding, or of the body itſelf.

What Dr Lind has above advanced is the more remarkable, as, in the two former editions of his book, he embraced the hypotheſis of animal-putrefaction being the cauſe of the ſcurvy; and if theſe effuſions of blood, from a deſtruction of its craſis and the diſſolved ſtate of the muſcular fibres, together with the rotten condition of the mouth and gums do not betray putreſcency, it is hard to ſay what does, or what other name we ſhall beſtow on this peculiar ſpecies of depravation which conſtitutes the ſcurvy.

The blood, no doubt, derives its healthy properties, and maintains them, from the due ſupplies of wholeſome food; while the inſoluble, ſuperfluous, effete, and acrid parts, are carried off by the ſeveral diſcharges of ſtool, urine, and perſpiration.

Our ſenſes of taſte and ſmell are ſufficient to inform us when our food is in a ſtate of ſoundneſs and ſweetneſs, and conſequently wholeſome; but it is from chemiſtry that we muſt learn the principles on which theſe qualities chiefly depend.

Experiments of various kinds have proved, that the ſoundneſs of animal and vegetable ſubſtances depends very much, if not entirely, on the preſence of their aerial principle; ſince rottenneſs is never obſerved to take place without an emiſſion of fixed air from the putrefying ſubſtance; and even when putrefaction has made a conſiderable progreſs, if aerial acid can be transferred, in ſufficient quantity, from ſome other ſubſtance in a ſtate of effervеſcence or fermentation, into the putrid body, the offenſive ſmell of this will be deſtroyed; and if it be a bit of rotten fleſh with which the experiment is made, the firmneſs of its fibres will be found in ſome meaſure reſtored.

The experiments of Dr Hales, as well as many others made ſince his time, ſhow that an aerial principle is greatly connected with, and remarkably abundant in, the gelatinous parts of animal bodies, and in the mucilage or farina of vegetables. But theſe are the parts of our food which are moſt particularly nutritive; and Dr Cullen, whoſe opinion on this as on every other medical ſubject muſt be allowed of the greateſt weight, affirms, in his Lectures on the Materia Medica, that the ſubſtances on which we feed are nutritious only in proportion to the quantities of oil and ſugar which they reſpectively contain. This oil and ſugar are blended together in the gelatinous part of our animal-food, and in the mucilaginous and farinaceous part of eſculent vegetables; and, while thus intimately combined are not perceivable by our taſte, though very capable of being developed and rendered diſtinct by the power of the digeſtive organs; for in conſequence of the changes produced during digeſtion, the oily and the ſaccharine matter become manifeſt to our ſenſes, as we may ſee and taſte in the milk of animals, which is chiefly chyle a little advanced in its progreſs toward ſanguification; the oil is obſerved to ſeparate ſpontaneouſly, and from which a quantity of actual ſugar may be obtained by a very ſimple proceſs.

Thus much being premiſed, we can now readily comprehend how the blood may come to loſe thoſe qualities of ſmoothneſs, mildneſs, and tenacity, which are natural to it. For if, in the firſt place, the fluids, and organs ſubſervient to digeſtion ſhould be ſo far diſtempered or debilitated that the nutritious parts of the food, cannot be properly developed, the blood muſt be defrauded of its due ſupplies; which will alſo be the caſe if the aliment ſhould not originally contain enough of oily and ſaccharine matter, or ſhould be ſo circumſtanced, from being dried or ſalted, as to hinder the ready extrication of the nutritious parts; or laſtly, if the natural diſcharges ſhould be interrupted or ſuſpended, ſo that the ſuperfluous, acrid, and effete fluids are retained in the general maſs; in all theſe inſtances the blood muſt of neceſſity run into proportionate degrees of depravation.

And hence we may underſtand how it may poſſibly happen, that when perſons are greatly weakened by ſome preceding diſorder, and at the ſame time debarred the uſe of proper bodily exerciſe, the ſcorbutic diatheſis ſhould take place, even though they enjoy the advantages of pure air and wholeſome diet. But theſe are ſolitary caſes, and very rarely ſeen; for whenever the ſcurvy ſeizes numbers, and can be conſidered as an epidemic diſeaſe, it will be found to depend on a combination of the major part, or perhaps all, of the following circumſtances:

1. A moiſt atmoſphere, and more eſpecially if cold be joined to this moiſture. 2. Too long ceſſation from bodily exerciſe, whether it be from conſtraint, or a lazy ſlothful diſpoſition. 3. Dejection of mind. 4. Neglect of cleanlineſs, and want of ſufficient clothing. 5. Want of wholeſome drink, either of pure water or fermented liquors. And, 6. Above all, the being obliged to live continually on ſalted meats, perhaps not well cured, without a due proportion of the vegetables ſufficient to correct the pernicious tendency of the ſalt, by ſupplying the bland oil and ſaccharine matter requiſite for the purpoſes of nutrition.

Theſe general principles reſpecting the cauſes and nature of ſcurvy, ſeem to afford a better explanation of the phenomena of the diſeaſe than any conjectures reſpecting it that have hitherto been propoſed. It muſt, however, be allowed, that Dr Lind is by no means the only writer who is diſpoſed to conſider this diſeaſe as not referable to the condition of the circulating fluids. In a late ingenious treatiſe on this ſubject by Dr Milman, he ſtrenuouſly contends, that the primary morbid affection in this complaint is a debilitated ſtate of the ſolids ariſing principally from want of aliment. But his arguments on this ſubject, as well as thoſe of Dr Lind, are very ably anſwered by a ſtill later writer on this ſubject, Dr Trotter, who has drawn his obſervations reſpecting it from very extenſive experience, and who conſiders it as clearly eſtabliſhed, by incontrovertible facts that the proximate cauſe of ſcurvy depends on ſome peculiar ſtate of the blood.—Dr Trotter, in the ſecond edition of his Obſervations on the Scurvy, from the reſult of farther obſervation and later diſcoveries in chemiſtry, has attempted, with much ingenuity, to prove that the morbid condition of the blood, which takes place in ſcurvy, ariſes from the abſtraction of vital air, or, as it is now generally called, *oxygene;* and this opinion, though ſtill, perhaps, in ſome particulars requiring farther confirmation, is, it muſt be allowed, ſupported by many plauſible arguments.

Prevention and Cure. The ſcurvy may be prevented, by obviating and correcting thoſe circumſtances in reſpect of the non-naturals which were mentioned as contributing to the diſeaſe, and laid down as cauſes. It is therefore a duty highly incumbent on officers commanding at ſea, or in garriſons, to uſe every poſſible precaution; and, in the firſt place, to correct the coldneſs and moiſture of the atmoſphere by ſufficient fires: in the next, to ſee that their men be lodged in dry, clean, and well ventilated births or apartments: thirdly, to promote cheerfulneſs, and enjoin frequent exerciſe, which alone is of infinite uſe in preventing the ſcurvy: fourthly, to take care that the cloathing be proper, and cleanlineſs of perſon ſtrictly obſerved: fifthly, to ſupply them with wholeſome drink, either pure water or ſound fermented liquors; and if ſpirits be allowed, to have them properly diluted with water and ſweetened with melaſſes or coarſe ſugar: and laſtly, to order the ſalted meats to be ſparingly uſed, or ſometimes entirely abſtained from; and in their place, let the people live on different compoſitions of the dried vegetables; freſh meat and recent vegetables being introduced as often as they can poſſibly be procured.

A cloſe attention to theſe matters will, in general, prevent the ſcurvy from making its appearance at all, and will always hinder it from ſpreading its influence far. But when theſe precautions have been neglected, or the circumſtances ſuch that they cannot be put in practice, and the diſeaſe hath actually taken place, our whole endeavour muſt be to reſtore the blood to its original ſtate of ſoundneſs: and happily, ſuch is the nature of this diſeaſe, that if a ſufficiency of new matter, of the truly mild nutritious ſort, and particularly ſuch as abounds with vital air, ſuch as recent vegetables, or different acid fruits, can be thrown into the circulation while the fleſhy fibres retain any tolerable degree of firmneſs, the patient will recover; and that in a ſurpriſingly ſhort ſpace of time, provided a pure air, comfortable lodgings, ſufficient cloathing, cleanlineſs, and exerciſe lend, their neceſſary aid.

This being the caſe, the plan of treatment is to be conducted almoſt entirely in the dietetic way; as the change in the maſs of blood, which it is neceſſary to produce, muſt be brought about by things that can be received into the ſtomach by pints or pounds, and not by thoſe which are adminiſtred in drops or grains, drachms or ounces. For here, as there is no diſorder of the nervous ſyſtem, we have no need of thoſe active drugs which are indiſpenſably neceſſary in febrile or nervous diſeaſes; the ſcorbutic diatheſis being quite oppoſite to that which tends to produce a fever or any ſpecies of ſpaſmodic diſorders; nay, Dr Lind ſays, he has repeatedly found, that even the infection of an hoſpital fever is long reſiſted by a ſcorbutic habit.

It will now naturally occur to the reader, what thoſe alimentary ſubſtances muſt be which bid the faireſt to reſtore the blood to its healthy ſtate; and he needs ſcarcely to be told, that they are of thoſe kinds which the ſtomach can bear with pleaſure though taken in large quantities, which abound in jelly or mucilage, and which allow thoſe nutritious parts to be eaſily developed; for though the viſcera in ſcorbutic patients may be all perfectly ſound, yet we cannot expect that either the digeſtive fluids or organs ſhould poſſeſs the ſame degrees of power, which enable them, during health, to convert the crude dry farinacea, and the hard ſalted fleſh of animals, into nouriſhment. We muſt therefore ſearch for the *antiſcorbutic virtue* in the tender ſweet fleſh of herbivorous animals; in new milk; and in the mucilaginous acid juices of recent vegetables, whether they be fruits, leaves, or roots.

The ſour juices of lemons, oranges, and limes, have been generally held as antiſcorbutics in an eminent degree, and their power aſcribed to their acid; from an idea that acids of all kinds are the only correctors of putrefaction. But the general current of practical obſervations

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obſervations ſhows, and our experiments confirm it, that the virtue of theſe juices depends on their *aerial principle;* accordingly, while perfectly recent and in the mucilaginous ſtate, and eſpecially if mixed with wine and ſugar, the juices of any one of theſe fruits will be found a moſt grateful and powerful antiſcorbutic.

Dr Lind obſerving, "that the lemon-juice, when given by itſelf undiluted, was apt, eſpecially if overdoſed, to have too violent an operation, by occaſioning pain and ſickneſs at the ſtomach, and ſometimes a vomiting; therefore found it neceſſary to add wine and ſugar. A pint of Madeira wine, and two ounces of ſugar, were put to four ounces and a half of juice, and this quantity was found ſufficient for weak patients to uſe in 24 hours: ſuch as were very weak ſipped a little of this frequently according as their ſtrength would permit; others who were ſtronger took about two ounces of it every two hours; and when the patients grew ſtill ſtronger, they were allowed eight ounces of lemon-juice in 24 hours."

While this very pleaſant mixture, which is both a cordial and an antiſeptic, may be had, it would be needleſs to think of preſcribing any other; but when the freſh juice cannot be procured, we muſt have recourſe to ſuch other things as may be obtained. But the various modes of combining and adminiſtering theſe, ſo as to render them perfectly agreeable to the ſtomach, muſt always be regulated by circumſtances, and therefore it will be in vain to lay down particular directions; ſince all that we have to do is, to fix on ſuch fruits and other freſh vegetables as can be moſt conveniently had and taken, and contrive to give them in thoſe forms, either alone or boiled up with fleſh-meat into ſoups, that will allow the patients to conſume the greateſt quantities.

The firſt promiſing alteration from ſuch a courſe is uſually a gentle diarrhœa; and if, in a few days, the ſkin becomes ſoft and moiſt, it is an infallible ſign of recovery; eſpecially if the patient gain ſtrength, and can bear being ſtirred or carried into the open air without fainting.

But if the belly ſhould not be looſened by the uſe of the freſh vegetables, nor the ſkin become ſoft and moiſt, then they muſt be aſſiſted by ſtewed prunes, or a decoction of tamarinds with cream of tartar, in order to abate the coſtiveneſs; and by drinking a light decoction of the woods, and wam bathing, in order to relax the pores of the ſkin; for nothing contributes more to the recovery of ſcorbutic patients than moderate ſweating.

With regard to particular ſymptoms, antiſeptic mouth-waters compoſed of a decoction of the Peruvian bark and infuſion of roſes, with a ſolution of myrrh, muſt be uſed occaſionally, in order to cleanſe the mouth, and give firmneſs to the ſpongy gums. Swelled and indurated limbs, and ſtiffened joints, muſt be bathed with warm vinegar, and relaxed by the ſteam of warm water, repeatedly conveyed to them, and confined to the parts by means of cloſe blankets: ulcers on the legs muſt never be treated with unctuous applications nor ſharp eſcharotics; but the dreſſing ſhould conſiſt of lint or ſoft rags, dipt in a ſtrong decoction of Peruvian bark.

This diſeaſe at no time requires, or indeed bears, large evacuations, either by bleeding or purging; and, as has been already mentioned, the belly muſt only be kept open by the freſh vegetables or the mildeſt laxatives. But we are always to be careful that ſcorbutic perſons, after a long abſtinence from greens and fruits, be not permitted to eat voraciouſly at firſt, leſt they fall into a fatal dyſentery.

All, however, that has now been laid down as neceſſary towards the cure, ſuppoſes the patients to be in ſituations where they can be plentifully furniſhed with all the requiſites; but unhappily theſe things are not to be procured at ſea, and often deficient in garriſons: therefore, in order that a remedy for the ſcurvy might never be wanting, Dr Macbride, in the year 1762, firſt conceived the notion, that the *infuſion of malt*, commonly called *wort*, might be ſubſtituted for the common antiſcorbutics; and it was accordingly tried.

More than three years elapſed before any account arrived of the experiments having been made; at length ten hiſtories of caſes were received, wherein the wort had been tried, with very remarkable ſucceſs; and this being judged a matter of great importance to the ſeafaring part of mankind, theſe were immediately communicated to the public in a pamphlet under the title of *An hiſtorical account of a new method of treating the ſcurvy at ſea.*

This was in 1767; but after that time a conſiderable number of letters and medical journals, ſufficient to make up a ſmall volume, were tranſmitted to the author, particularly by the ſurgeons of his Britannic Majeſty's ſhips who had been employed of late years for making diſcoveries in the ſouthern hemiſphere. Certain it is, that in many inſtances it has ſucceeded beyond expectation. In others it has fallen ſhort: but whether this was owing to the untoward ſituation of the patients, or inattention on the part of the perſons who were charged with the adminiſtration of the wort, not preparing it properly, or not giving it in ſufficient quantity, or to its own want of power, muſt be collected from the caſes and journals themſelves.

During Captain Cook's third voyage, the moſt remarkable, in reſpect of the healthineſs of the crew, that ever was performed, the wort is acknowledged to have been of ſingular uſe.

In a letter which this very celebrated and ſucceſsful circumnavigator wrote to Sir John Pringle, he gives an account of the methods purſued for preſerving the health of his people; and which were productive of ſuch happy effects, that he performed "a voyage of three years and 18 days, through all the climates from 52° north to 71° ſouth, with the loſs of one man only by diſeaſe, and who died of a complicated and lingering illneſs, without any mixture of ſcurvy. Two others were unfortunately drowned, and one killed by a fall; ſo that out of the whole number 118 with which he ſet out from England, he loſt only four.

He ſays, that much was owing to the extraordinary attention of the admiralty, in cauſing ſuch articles to be put on board as either by experience of conjecture were judged to tend moſt to preſerve the health of ſeamen; and with reſpect to the wort, he expreſſes himſelf as follows:

"We had on board a large quantity of *malt*, of which was made *ſweet wort*, and given (not only to thoſe men who had manifeſt ſymptoms of the ſcurvy, but to ſuch alſo as were, from circumſtances, judged to be moſt liable to that diſorder) from one or two to three pints in the day to each man, or in ſuch proportion as the ſurgeon thought neceſſary, which ſometimes amounted to three quarts in the 24 hours: this is without doubt one of the beſt antiſcorbutic ſea-medicines yet found out; and if given in time, will, with proper attention to other things, I am perſuaded, prevent the ſcurvy from making any great progreſs for a conſiderable time: but I am not altogether of opinion that it will cure it, in an advanced ſtate, at ſea."

On this laſt point, however, the Captain and his Surgeon differ; for this gentleman poſitively aſſerts, and his journal (in Dr Macbride's poſſeſſion) confirms it, that the infuſion of malt did effect a cure in a confirmed caſe, and at ſea.

The malt, being thoroughly dried, and packed up in ſmall caſks, is carried to ſea, where it will keep ſound, in every variety of climate, for at leaſt two years: when wanted for uſe, it is to be ground in a hand-mill, and the infuſion prepared from day to day, by pouring three meaſures of boiling water on one of the ground malt; the mixture being well maſhed, is left to infuſe for 10 or 12 hours, and the clear infuſion then ſtrained off. The patients are to drink it in ſuch quantities as may be deemed neceſſary, from one to three quarts in the courſe of the 24 hours: a panado is alſo to be made of it, by adding biſcuit, and currants or raiſins; and this palatable meſs is uſed by way of ſolid food. This courſe of diet, like that of the recent vegetables, generally keeps the bowels ſufficiently open; but in caſes where coſtiveneſs nevertheleſs prevails, gentle laxatives muſt be interpoſed from time to time, together with diaphoretics, and the topical aſſiſtants, fomentations and gargles, as in the common way of management.

Captain Cook was alſo provided with a large ſtock of *ſour krout;* (cabbage-leaves cut ſmall, fermented and ſtopped in the ſecond ſtage of fermentation.) A pound of this was ſerved to each man, twice a-week, while they were at ſea. Sour krout, ſince the trial made of it on board Captain Cook's ſhips, has been extenſively uſed by direction of the Britiſh government in many other ſituations, where ſcorbutus has prevailed; and it has been found to be highly ſerviceable both in preventing and in curing the diſeaſe. It was particularly found during the late American war to be highly beneficial to the Britiſh troops beſieged in Boſton, who were at that time entirely fed on ſalt proviſions ſent from England. The ſcurvy at one period broke out among them with very alarming appearances; but by the ſeaſonable arrival of a quantity of ſour krout, it was effectually overcome. Care, however, muſt be beſtowed, that this article be properly prepared and properly kept. When due attention is paid to theſe particulars, it may be preſerved in good condition for many months; and is conſidered both by ſailors and ſoldiers as a very acceptable addition to their ſalt proviſions. But when ſerved out to them in a putrid ſtate, it is not only highly diſagreeable to the taſte, but probably alſo pernicious in its effects.

Among other means of preventing ſcurvy, Captain Cook had alſo a liberal ſupply of *portable ſoup*; of which the men had generally an ounce, three days in the week, boiled up with their peaſe; and ſometimes it was ſerved to them oftener; and when they could get freſh greens, it was boiled up with them, and made ſuch an agreeable meſs, that it was the means of making the people eat a greater quantity of greens than they would otherwiſe have done. And what was ſtill of further advantage, they were furniſhed with ſugar in lieu of butter or oil, which is ſeldom of the ſweeteſt ſort; ſo that the crew were undoubtedly great gainers by the exchange.

In addition to all theſe advantages of being ſo well provided with every neceſſary, either in the way of diet or medicine, Captain Cook was remarkably attentive to all the circumſtances reſpecting cleanlineſs, exerciſe, ſufficient cloathing, proviſion of pure water, and purification of the air in the cloſer parts of the ſhip.

From the effect of theſe different means, as employed by Captain Cook, there can be little doubt that they will with due attention be ſufficient for the prevention and cure of the diſeaſe, at leaſt in moſt ſituations: but beſides theſe, there are alſo ſome other articles which may be employed with great advantage.

Newly brewed ſpruce-beer made from a decoction of the tops of the ſpruce-fir and melaſſes, is an excellent antiſcorbutic: it acts in the ſame way that the wort does, and will be found of equal efficacy, and therefore may be ſubſtituted. Where the tops of the ſpruce-fir are not to be had, this beer may be prepared from the eſſence of ſpruce as it has been called, an article which keeps eaſily for a great length of time. But in ſituations where neither the one nor the other can be had, a moſt ſalutary meſs may be prepared from oatmeal, by infuſing it in water, in a wooden veſſel, till it ferments, and begins to turn ſouriſh; which generally happens, in moderately warm weather, in the ſpace of two days.—The liquor is then ſtrained off from the grounds, and boiled down to the conſiſtence of a jelly, which is to be eat with wine and ſugar, or with butter and ſugar.

Nothing is more commonly talked of than a *land-ſcurvy*, as a diſtinct ſpecies of diſeaſe from that which has been now deſcribed; but no writer has yet given a deſcription ſo clear as to enable us to diſtinguiſh it from the various kinds of cutaneous foulneſs and eruption, which indeed are vulgarly termed *ſcorbutic*, but which are a-kin to the itch or leproſy, and for the moſt part require mercurials. Theſe, however, are very different diſeaſes from the true ſcorbutus, which, it is well known, may prevail in certain ſituations on land as well as at ſea, and is in no degree to be attributed to ſea air.

GENUS LXXXVII. ELEPHANTIASIS. 352

Elephantiaſis, *Sauv.* gen. 302. *Vog.* 321. *Sag.* gen. 128.
Elephantia Arabum, *Vog.* 322.

The beſt account of this diſeaſe is that by Dr Heberden, publiſhed in the firſt volume of the Medical Tranſactions. According to him, frequently the firſt ſymptom is a ſudden eruption of tubercles, or bumps of different ſizes, of a red colour, more or leſs intenſe (attended

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(attended with great heat and itching), on the body, legs, arms, and face; ſometimes in the face and neck alone, at other times occupying the limbs only; the patient is feveriſh; the fever ceaſing, the tubercles remain indolent, and in ſome degree ſcirrhous, of a livid or copper colour, but ſometimes of the natural colour of the ſkin, or at leaſt very little altered; and ſometimes they after ſome months ulcerate, diſcharging a fetid ichorus humor in ſmall quantity, but never laudable pus.

The features of the face ſwell and enlarge greatly; the part above the eye-brows ſeems inflated; the hair of the eye-brows falls off, as does the hair of the beard; but Dr Heberden has never ſeen any one whoſe hair has not remained on his head. The *alæ naſi* are ſwelled and ſcabrous; the noſtrils patulous, and ſometimes affected with ulcers, which, corroding the cartilage and *ſeptum naſi*, occaſion the noſe to fall off. The lips are tumid; the voice is hoarſe; which ſymptom has been obſerved when no ulcers have appeared in the throat, although ſometimes both the throat and gums are ulcerated. The ears, particularly the lobes, are thickened, and occupied by tubercles. The nails grow ſcabrous and rugoſe, appearing ſomething like the rough bark of a tree; and the diſtemper advancing, corrodes the parts gradually with a dry ſordid ſcab or gangrenous ulcer; ſo that the fingers and toes rot and ſeparate joint after joint. In ſome patients the legs ſeem rather poſts than legs, being no longer of the natural ſhape, but ſwelled to an enormous ſize, and indurated, not yielding to the preſſure of the fingers; and the ſuperficies is covered with very thin ſcales, of a dull whitiſh colour, ſeemingly much finer, but not ſo white as thoſe obſerved in the *lepra Græcorum.* The whole limb is overſpread with tubercles, interſperſed with deep fiſſures; ſometimes the limb is covered with a thick moiſt ſcabby cruſt, and not unfrequently the tubercles ulcerate. In others the legs are emaciated, and ſometimes ulcerated; at other times affected with tubercles without ulceration. The muſcular fleſh between the thumb and fore-finger is generally extenuated.

The whole ſkin, particularly that of the face, has a remarkably ſhining appearance, as if it was varniſhed or finely poliſhed. The ſenſation in the parts affected is very obtuſe, or totally aboliſhed; ſo that pinching, or puncturing the part, gives little or no uneaſineſs; and in ſome patients, the motion of the fingers and toes is quite deſtroyed. The breath is very offenſive; the pulſe in general weak and ſlow.

The diſeaſe often attacks the patient in a different manner from that above deſcribed beginning almoſt inſenſibly; a few indolent tubercles appearing on various parts of the body or limbs, generally on the legs or arms, ſometimes on the face, neck, or breaſt, and ſometimes in the lobes of the ears, increaſing by very ſlow degrees, without any diſorder, previous or concomitant, in reſpect of pain or uneaſineſs.

To diſtinguiſh the diſtemper from its manner of attacking the patient. Dr Heberden ſtyles the firſt by *fluxion* and the other by *congeſtion.* That by fluxion is often the attendant of a crapula, or ſurfeit from groſs foods; whereby, perhaps, the latent ſeeds of the diſorder yet dormant in the maſs of blood are excited: and probably from frequent obſervations of this kind (the laſt meal always having the blame laid on it), it is, that, according to the received opinion, either fiſh, (the tunny, mackarel, and ſhell-fiſh, in particular), melons, cucumbers, young garden-beans, or mulberries, eaten at the ſame meal with butter, cheeſe, or any preparation with milk, are ſuppoſed to produce the diſtemper, and are accordingly religiouſly avoided.

Elephantiasis.

Violent commotions of the mind, as anger, fear, and grief, have more than once been obſerved to have given riſe to the diſorder; and more frequently, in the female ſex, a ſudden ſuppreſſion of an accuſtomed evacuation, by bathing the legs and feet in cold water at an improper ſeaſon,

The diſorder by fluxion is what is the ofteneſt endeavoured to be remedied by timely application; that by congeſtion, not being ſo conſpicuous, is generally either neglected or attempted to be concealed, until perhaps it be too late to be cured, at leaſt unleſs the patients would ſubmit to a longer courſe of medicine and ſtricter regimen of diet than they are commonly inclined to do.

Several incipient diſorders by fluxion have been known to yield to an antiphlogiſtic method, as bleeding, refrigerant ſalts, in the ſaline draughts, and a ſolution of cryſtals of tartar in water, for common drink, (by this means endeavouring to precipitate part of the peccant matter, perhaps too groſs to paſs the pores by the kidneys); and when once the fever is overcome, the Peruvian bark combined with ſaſſafras is the remedy principally to be relied on. The only topical medicine preſcribed by Dr Heberden, was an attenuating embrocation of brandy and alkaline ſpirit. By the ſame method ſome confirmed caſes have been palliated. But, excepting in one patient he never ſaw or heard of a confirmed elephantiaſis radically cured. He adds however, that he never met with another patient poſſeſſed with prudence and perſeverance enough to proſecute the cure as he ought.

GENUS LXXXVIII. LEPRA. 353

The LEPROSY.

Lepra, *Sauv.* gen. 303. *Lin.* 262. *Sag.* 129.
Lepra *Græcorum.* *Vog.* 320.

THIS diſtemper is but little known to phyſicians in the weſtern parts of Europe. Wallis tells us, that it firſt begins with red pimples, or puſtules, breaking out in various parts of the body. Sometimes they appear ſingle; ſometimes a great number ariſe together; eſpecially on the arms and legs: as the diſeaſe increaſes, freſh pimples appear, which, joining the former, make a ſort of cluſters; all which enlarge their borders, and ſpread in an orbicular form. The ſuperficies of theſe puſtules are rough, whitiſh, and ſcaly; when they are ſcratched the ſcales fall off, upon which a thin ichor oozes out, which ſoon dries and hardens into a ſcaly cruſt. Theſe cluſters of puſtules are at firſt ſmall and few; perhaps only three or four in an arm or leg, and of the ſize of a ſilver penny. But if the diſeaſe be ſuffered to increaſe, they become more numerous, and the cluſters increaſe to the ſize of a crown-piece, but not exactly round. Afterwards it increaſes to ſuch a degree, that the whole body is covered with a leprous ſcurf. The cure of this diſtemper is very much the

Impetigines

ſame with that of the Elephantiasis. Here, however, recourſe is frequently had to antimonial and mercurial medicines, continued for a conſiderable length of time. In conjunction with theſe, warm bathing, particularly the vapour bath, has often been employed with advantage.

Although what can ſtrictly be called lepra is now at leaſt, a very rare diſeaſe in this country, yet to this general head may be referred a variety of cutaneous affections which are there very common, and which in many inſtances prove very obſtinate. Theſe appear under a variety of different forms; ſometimes under that of red puſtules; ſometimes of white ſcurfs; ſometimes of ulcerations; and not unfrequently a tranſition takes place from one form to another, ſo that they cannot be divided into different genera from the external appearance. Theſe affections will often yield to the remedies already mentioned; but where antimonials and mercurials either fail, or from different circumſtances are conſidered as unadviſable, a cure may ſometimes be effected by others. In particular caſes, purging mineral waters, the decoction of elm bark, the infuſion of the œnanthe crocata, and various others, have been employed with ſucceſs. Different external applications alſo have ſometimes been employed with advantage. An article uſed in this way, known under the name of Gowland's lotion, with the compoſition of which we are unacquainted, has been much celebrated, and has been ſaid to be uſed with great ſucceſs, particularly againſt eruptions on the face and noſe.

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Genus LXXXIX. FRAMBOESIA.

The Yaws.

Frambœſia, *Sauv.* gen. 125. *Sag.* 125.

Deſcription. The deſcription which is given of this diſtemper by the anonymous author of a paper in the ſixth volume of the Edinburgh Medical Eſſays (art. 76.) differs, in ſome circumſtances, from one that Sauvages received from M. Virgile, an eminent ſurgeon of Montpelier, who practiſed 12 years in the iſland of St Domingo; and therefore he diſtinguiſhes the *frambœſia* into two ſpecies, *Guineenſis* and *Americana*.

Frambœſia

The *frambœſia Guineenſis* is ſaid by the firſt mentioned writer to be ſo common on the coaſt of Guinea and other parts of Africa, that it ſeldom fails to attack each individual of both ſexes, one time or other in the courſe of their lives; but moſt commonly during childhood or youth. "It makes its apppearance in little ſpots on the cuticle, level with the ſkin, at firſt no larger than a pin's head which increaſe daily, and become protuberant like pimples: ſoon after the cuticle frets off, and then, inſtead of finding pus or ichor, in this ſmall tumor, only white ſloughs or ſordes appear, under which is a ſmall red fungus growing out of the cutis, increaſing gradually to very different magnitudes, ſome leſs than the ſmalleſt wood ſtrawberry, ſome as big as a raſpberry, and others exceeding in ſize even the largeſt mulberries; which berries they very much reſemble, being knobbed as they are." Theſe protuberances, which gave the name to the diſeaſe, appear on all parts of the body; but the greateſt numbers, and the largeſt ſized, are generally found in the groins, and about the pudenda or anus, in the arm-pits, and on the face; when the yaws are very large, they are few in number; and when remarkably numerous, they are leſs in ſize. The patients, in all other reſpects, enjoy good health, do not loſe their appetite, and ſeem to have little other uneaſineſs than what the ſores occaſion.

M. Virgile deſcribes the ſpecies of yaws that is common among the negroes of St Domingo, and which Sauvages has termed *frambœſia Americana*, as beginning from an ulcer that breaks out indiſcriminately in different parts of the body, though moſt commonly on the legs; at firſt ſuperficial, and not different from a common ulcer in any other circumſtances ſave its not healing by the uſual applications; ſooner or later, numerous fungous excreſcences break out on the ſurface of the body, as before deſcribed, like little berries moiſt, with a reddiſh mucus. Beſides theſe, the ſoles of the feet and palms of the hands became raw, the ſkin fretting off, ſo as to leave the muſcles bare; theſe excoriations are ſometimes moiſt with ichor and ſometimes dry, but always painful and conſequently very diſtreſſing. They are mentioned alſo by the author of the article in the Medical Eſſays; and both he and M. Virgile obſerve, that there is always one excreſcence, or yaw, of an uncommon ſize, which is longer in falling off than the others, and which is conſidered as the *maſter-yaw*, and ſo termed. An ingenious inaugural diſſertation on the ſubject of the yaws was lately publiſhed at Edindurgh by Dr Jonathan Anderſon Ludford, now phyſician in Jamaica. The author of that diſſertation conſiders Dr Cullen as improperly referring frambœſia to the claſs of cachexiæ. He thinks that this diſeaſe ought rather to be referred to the exanthemata; for, like the ſmall-pox, he tells us it has its acceſſion, height, and decline. It begins with ſome degree of fever, either more or leſs violent it may be propagated by inoculation; and it attacks the ſame individual only once in the courſe of a lifetime, thoſe who once recover from the diſeaſe being never afterwards affected with it. Theſe particulars reſpecting frambœſia are reſted not merely on the authority of Dr Ludford, but are ſupported alſo by the teſtimony of Dr William Wright, a phyſician of diſtinguiſhed eminence, who, while he reſided in Jamaica had, in the courſe of extenſive practice, many opportunities of obſerving this diſeaſe, and to whom Dr Ludford acknowledges great obligations for having communicated to him many important facts reſpecting it.

Dr Ludford conſiders the yaws as being in every inſtance the conſequence of contagion, and as depending on a matter *ſui generis*. He conſiders no peculiar prediſpoſition from diet, colours, or other circumſtances, as being in any degree neceſſary. He views the diſeaſe as chiefly ariſing from contact with the matter, in conſequence of ſleeping in the ſame bed, waſhing in the ſame veſſel with the infected, or the like. In ſhort, the yaws may be communicated by any kind of contact; nay, it is even believed that flies often convey the infection, when, after having gorged themſelves with the virulent matter by ſucking the ulcers of thoſe who are diſeaſed, they make punctures in the ſkin of ſuch as are ſound, and thus inoculate them; in conſequence of which the diſorder will ſoon appear, provided the *morbific diſpoſition* of body be preſent.

Prognoſis. The yaws are not dangerous, if the cure be ſkilfully managed at a proper time; but if the patient has been prematurely ſalivated, or has taken any quantity of mercury, and his ſkin been ſuddenly cleared thereby, the cure will be very difficult, if not impracticable.

Cure. In attempting the cure of this diſeaſe, the four following indications are chiefly to be held in view:

1. To ſupport the ſtrength of the patient.
2. To promote excretion by the ſkin.
3. To correct the vitiated fluids.
4. To remove and counteract the injuries done either to the conſtitution in general, or to particular parts by the diſeaſe.

With the firſt of theſe intentions, a liberal diet, conſiſting of a conſiderable quantity of animal food, with a conſiderable proportion of wine, and gentle exerciſe, are to be employed: but the cure is principally to be effected by mercurial ſalivation, after the virulent matter has been completely thrown out to the ſurface of the body by ſudorifics. The following are the particular directions given on this head by the author of the article in the Medical Eſſays. The yaws being an infectious diſeaſe, as ſoon as they begin to appear on a negro, he muſt be removed to a houſe by himſelf; or if it is not certain whether the eruption be the yaws or not, ſhut him up ſeven days, and look on him again, as the Jews were commanded to do with their lepers, and in that time you may be commonly certain.

As ſoon as you are convinced that it is the yaws, give a bolus of flowers of ſulphur, with camphor and theriaca. Repeat this bolus every night for a fortnight or three weeks, or till the yaws come to the height; that is, when they neither increaſe in ſize or number: then throw your patient into a gentle ſalivation with calomel given in ſmall doſes, without farther preparation; five grains repeated once, twice, or thrice a-day, is ſufficient, as the patient can bear it. If he ſpits a quart in 24 hours, it is enough. Generally, when the ſalivation is at this height, all the yaws are covered with a dry ſcaly cruſt or ſcab; which, if numerous, look terribly. Theſe fall off daily in ſmall white ſcales; and in ten or twelve days leave the ſkin ſmooth and clean. Then the calomel may be omitted, and the ſalivation permitted to go off of itſelf. A dram of corroſive ſublimate diſſolved in an ounce of rum or brandy, and the ſolution daubed on the yaws, will, it is ſaid, in general clear the ſkin in two days time.

After the ſalivation, ſweat the patient twice or thrice in a frame or chair with ſpirits of wine; and give an alterative electuary, of æthiops and gum guaiac. He may likewiſe uſe the decoction of guaiacum and ſaſſafras fermented with melaſſes, for his conſtant drink while the electuary is taking, and a week or a fortnight after the electuary is finiſhed.

The maſter-yaw muſt be conſumed an eighth or a tenth of an inch below the ſkin, with *Mercur. corroſ. rub.* & *alum. uſt. an. part. æqual.* and digeſted with *Ung. baſil. flav.* ℥j. and *mercur. corroſ. rub.* ʒj. and cicatrized with lint preſſed out of ſpirits of wine, and with the vitriol of copper.

After the yaws are cured, ſome patients are afflicted with carbuncles in their feet; which ſometimes render them incapable of walking, unleſs with pain. The method of cure is, by bathing and paring, to deſtroy the cuticle, and then proceed as in the maſter-yaw. The gentle eſcharotics are to be preferred, eſpecially here; and all imaginable care is to be taken to avoid the tendons and perioſteum.

To children under ſix or ſeven years old, at the proper time of ſalivating, when the yaws are come to their full growth, give a grain or two of calomel in white ſugar, once a-day, once in two days, or once in three days, ſo as only to keep their mouths a little ſore till the yaws dry, and, falling off in white ſcales, leave the ſkin clean. This ſucceeds always, but requires a longer time than in adults.

In St Domingo they ſalivated by unction: but it does not appear that ſucceſs always followed this practice. It is alſo uſual in that iſland to give the ſolution of corroſive ſublimate along with a decoction of ſarſaparilla. Twelve ounces of this root, and 12 pounds of the coarſeſt ſugar, macerated for 15 days in 12 quarts of water, is mentioned as a ſpecific, and ſaid to be the preſcription of an Engliſh phyſician; the doſe is four ounces every ſixth hour.

GENUS XC. TRICHOMA. 355

The PLICA POLONICA, or *Plaited Hair.*

Trichoma, *Sauv.* gen. 311. *Sag.* 137.
Plica, *Lin.* 313.
Plica ſive Rhopaloſis, *Vog.* 323.

THIS diſorder is only met with in Poland and Lithuania, and conſiſts of ſeveral blood-veſſels running from the head into the ends of the hairs; which cleave together, and hang from the head in broad flat pieces, generally about an ell in length, but ſometimes they are five or ſix yards long; one patient hath more or leſs of theſe, up to 20, and ſometimes 30. They are painful to the wearer, and odious to every ſpectator. At the approach of winter an eruptive fever happens to many in theſe countries: the eruptions principally infeſt the head, and when at the height an ichorous humour flows from them. In this ſtate they are too tender to admit of being touched, and the matter running down the hairs mats them together; the ſkin by degrees breaking, the ramifications of the capillary veſſels following the courſe of the hair, or prolonged out of the ſkin are increaſed to a vaſt length.

No method of relief is yet known; for if the diſcharge be checked, or the veſſels cut off, the conſequence is an increaſe of more miſerable ſymptoms, and in the end death. Sennertus ſays, when all the morbid matter is thrown out of the body the plicæ fall off ſpontaneouſly. He further obſerves, that the only ſafe practice in this caſe is, to ſolicit the peccant matter to the hairs, to which it naturally tends; and that this is beſt anſwered by lotions of bear's breech. Some ſay that a decoction of the herb club-moſs, and its ſeeds, with which the head is to be waſhed, is a ſpecific.

GENUS XCI. ICTERUS. 356

The JAUNDICE.

Icterus, *Lin.* 244. *Vog.* 306. *Boerh.* 918. *Junck.* 90.
Aurigo, *Sauv.* gen. 306. *Sag.* 132.
Cachexia icterica, *Hoffm.* III. 301.

Deſcription. The jaundice firſt ſhows itſelf by a liſtleſſneſs and want of appetite, the patient becomes dull, oppreſſed, and generally coſtive. Theſe ſymptoms have continued but a very ſhort time, when a yellow colour begins to diffuſe itſelf over the *tunica albuginea* or white part of the eye, and the nails of the fingers; the urine becomes high coloured, with a yellowiſh ſediment capable of giving a yellow tinct to linen; the ſtools are whitiſh or grey. In ſome there is a moſt violent pain in the epigaſtric region, which is conſiderably increaſed after meals. Sometimes the patient has a continual propenſity to ſleep; but in others there is too great watchfulneſs; and ſometimes the pain is ſo great, that though the patient be ſleepy he cannot compoſe himſelf to reſt. The pains come by fits; and moſt women who have had the jaundice and born children, agree, that they are more violent than labour-pains. As the diſeaſe increaſes, the yellow colour becomes more and more deep; an itching is felt all over the ſkin; and even the internal membranes of the viſcera, the bones, and the brain itſelf, become tinged, as hath been ſhown from diſſections, where the bones have been found tinged ſometimes for years after the jaundice has been cured.

In like manner, all the ſecretions are affected with the yellow colour of the bile, which in this diſeaſe is diffuſed throughout the whole maſs of fluids. The ſaliva becomes yellowiſh and bitter; the urine exceſſively high-coloured, in ſuch a manner as to appear almoſt black; nay, the blood itſelf is ſometimes ſaid to appear of a yellow colour when drawn from a vein; yet Dr Heberden ſays that he never ſaw the milk altered in its colour, even in caſes of very deep jaundice. In proceſs of time the blood begins to acquire a tendency to diſſolution and putrefaction; which is known by the patient's colour changing from a deep yellow to a black or dark yellow. Hæmorrhagies enſue from various parts of the body, and the patients frequently die of an apoplexy; though in ſome the diſeaſe degenerates into an incurable dropſy; and there have not been wanting inſtances of ſome who have died of the dropſy after the jaundice itſelf had been totally removed.

Cauſes. As the jaundice conſiſts in a diffuſion of the bile throughout the whole ſyſtem, it thence follows, that whatever may favour this diffuſion is alſo to be reckoned among the cauſes of jaundice. Many diſputes have ariſen concerning the manner in which the bile is reſorbed into the blood; but it is now generally agreed that it is taken up by the lymphatics of the gall-bladder and biliary ducts. Hence, a jaundice may ariſe from any thing obſtructing the paſſage of the bile into the duodenum, or from any thing which alters the ſtate of the lymphatics in ſuch a manner as to make them capable of abſorbing the bile in its natural ſtate. Hence the jaundice may ariſe from ſcirrhi of the liver or other viſcera preſſing upon the biliary ducts, and obſtructing the paſſage of the bile; from flatus diſtending the duodenum, and ſhutting up the entrance of the ductus communis choledochus into it; from the ſame orifice being plugged up by viſcid bile or other ſordes; but by far the moſt frequent cauſe of jaundice is the formation of calculi, or more properly biliary concretions: for although they were long conſidered as being of a calcareous nature, yet more accurate experiments have now demonſtrated, that they conſiſt principally of a ſebaceous matter; accordingly, while they are ſo light as to ſwim in water, they are alſo highly inflammable. Theſe are found of almoſt all ſizes, from that of a ſmall pea to that of a walnut, or bigger: they are of different colours; and ſometimes appear as if formed in the inward part by cryſtallization, but of lamellæ on the outer part; though ſometimes the outward part is covered with rough and ſhining cryſtals, while the inward part is lamellated. Theſe enter into the biliary ducts and obſtruct them, cauſing a jaundice, with a violent pain for ſome time; and which can be cured by no means till the concretion is either paſſed entirely through the ductus communis or returned into the gall-bladder. Sometimes, in the opinion of many celebrated phyſicians, the jaundice is occaſioned by ſpaſmodic conſtrictions of the biliary ducts; but this is denied by others, and it is not yet aſcertained whether theſe ducts are capable of being affected by ſpaſm or not, as the exiſtence of muſcular fibres in them has not with certainty been diſcovered. It cannot, however, be denied, that violent fits of paſſion have often produced jaundice, ſometimes temporary, but frequently permanent. This has been by ſome deemed a ſufficient proof of the ſpaſmodic contraction of the ducts; but their opponents ſuppoſe, that the agitation occaſioned by the paſſion might puſh forward ſome biliary concretion into a narrow part of the duct, by which means a jaundice would certainly be produced, till the concretion was either driven backward or forward into the duodenum altogether. But even ſuppoſing the ducts themſelves to be incapable of ſpaſm, yet there can be no doubt that by a ſpaſm of the inteſtines biliary concretions may be retained in the ducts; and indeed it is principally where the duct entering obliquely into the inteſtines forms as it were a ſpecies of valve that theſe concretions are retained.

In a very relaxed ſtate of the body there is alſo an abſorption of the bile, as in the yellow fever; and indeed in all putrid diſorders there is a kind of yellowiſh tinct over the ſkin, though much leſs than in the true jaundice. The reaſon of this is, that in theſe diſorders there is uſually an increaſed ſecretion of bile, commonly of a thinner conſiſtence than in a healthy ſtate, while the orifices of the lymphatics are probably enlarged, and thus ready to abſorb a fluid ſomewhat thicker than what they ought to take up in a healthy ſtate; but theſe diſeaſes are of ſhort duration in compariſon with the real jaundice, which ſometimes laſts for many years. Theſe affections, however, cannot with propriety in any caſe be conſidered as real inſtances of jaundice; for to conſtitute that diſeaſe, bile muſt not only be preſent in the blood, but wanting in the alimentary canal.

It is obſervable, that women are more ſubject to jaundice than men, which probably ariſes from their more ſedentary life; for this, together with ſome of the depreſſing paſſions of the mind, are found to promote the acceſſion of the diſeaſe, if not abſolutely to produce it. Pregnant women are alſo frequently attacked by the jaundice, which goes off after their delivery.

Prognoſis. As jaundice may ariſe from many different cauſes, ſome of which cannot be diſcovered during the patient's life, the prognoſis muſt on this account be very uncertain. The only caſes which admit of a cure are thoſe depending upon biliary concretions, or obſtructions of the biliary ducts by viſcid bile; for the concretions are ſeldom of ſuch a ſize that the ducts will not let them paſs through, though frequently not without extreme pain. Indeed this pain, though ſo violent, and almoſt intolerable to the ſick perſon, affords the beſt prognoſis; as the phyſician may readily aſſure his patient that there is great hope of his being relieved from it. The coming on of a gentle diarrhœa, attended with bilious ſtools, together with the ceſſation of pain, are ſigns of the diſeaſe being cured. We are not however, always to conclude, becauſe the diſeaſe is not attended with acute pain, that it is therefore incurable; for frequently the paſſage of a concretion through the biliary ducts is accompanied only with a ſenſation of ſlight uneaſineſs.

Cure. The great object to be aimed at in the cure of jaundice is unqueſtionably the removal of the cauſe which obſtructs the paſſage of bile into the inteſtine: But before this can be accompliſhed, practices are often neceſſary for alleviating urgent ſymptoms; which may be done ſometimes by ſupplying the want of bile in the alimentary canal, ſometimes by affording an exit for bilious matter from the general maſs of blood, but moſt frequently by obviating the effects of diſtenſion and obſtruction to the circulation in the ſyſtem of the liver.

The meaſures to be employed for the removal of the obſtruction muſt depend very much on the nature of the obſtructing cauſe.

When the jaundice ariſes from indurated ſwellings or ſcirrhi of the viſcera, it is abſolutely incurable; nevertheleſs, as theſe cannot always be diſcovered, the phyſician ought to proceed in every caſe of jaundice as if it aroſe from calculi. The indications here are, 1. To diſſolve the concretions; and, 2. To prevent their formation a ſecond time. But unhappily the medical art has not yet afforded a ſolvent for biliary concretions. They cannot even be diſſolved when tried out of the body either by acids or alkalies, or any thing but a mixture of oil of turpentine and ſpirit of wine; and theſe ſubſtances are by far too irritating to be given in ſufficient quantity to affect a concretion in the biliary ducts. Boerhaave obſerves, that diſeaſes of the liver are much more difficult to cure than thoſe in any other part of the body; becauſe of the difficulty there is in getting at the part affected, and the tedious and round-about paſſage the blood hath to it. The juice of common graſs has indeed been recommended as a ſpecific in the jaundice, but on no very good foundation. Gliſſon obſerves, that black cattle are ſubject to biliary concretions when fed with hay or dried ſtraw in winter, but are cured by the ſucculent graſs in the ſpring; and Van Swieten tells a ſtrange ſtory of a man who cured himſelf of the jaundice by living almoſt entirely on graſs, of which he devoured ſuch quantities, that the farmers were wont to drive him out of their fields; but other practitioners have by no means found this in any degree effectual. The only method of cure now attempted in the jaundice is to expel the concretion into the inteſtines; for which vomits and exerciſe are the principal medicines. The former are juſtly reckoned the moſt efficacious medicines, as they powerfully ſhake all the abdominal and thoracic viſcera; and thus tend to diſlodge any obſtructing matter that may be contained in them. But if there be a tendency to inflammation, vomits muſt not be exhibited till bleeding has been premiſed. We muſt alſo proceed with caution if the pain be very ſharp; for in all caſes where the diſeaſe is attended with violent pain, it will be neceſſary to allay it by opiates before the exhibition of an emetic. There is alſo danger, that by a continued uſe of vomits, a concretion which is too large to paſs, may be ſo impacted in the ducts, that it cannot even be returned into the gall-bladder; which would otherwiſe have happened. In all caſes, therefore, if no relief follows the exhibition of the ſecond or third emetic, it will be prudent to forbear their farther uſe for ſome time.

Of all kinds of exerciſe, that of riding on horſeback is moſt to be depended upon in this diſeaſe. It operates in the ſame manner with vomits, namely, by the concuſſion it gives to the viſcera; and therefore the cautions neceſſary to be obſerved in the uſe of vomits are alſo neceſſary to be obſerved in the uſe of riding. Cathartics alſo may be of ſervice, by cleanſing the *primæ viæ*, and ſoliciting a diſcharge of the bile into the inteſtines; but they muſt not be of too draſtic a nature, elſe they may produce incurable obſtructions, by bringing forward concretions that are too large to paſs. Anodynes and the warm bath are ſerviceable by their relaxing quality; and there can be no doubt that, from acting as powerful antiſpaſmodics, they often give an opportunity for the diſcharge of concretions by very ſlight cauſes, when they would otherwiſe be firmly retained. Soap has been ſuppoſed to do ſervice as a ſolvent; but this is now found to be a miſtake, and it acts in no other way than as a relaxant or as a gentle purgative.

But when all means of relief fail, as in caſes of ſcirrhous, we can then only attempt to palliate the ſymptoms, and preſerve the patients's life as long as poſſible. This is beſt accompliſhed by diuretics; for thus a great quantity of bilious matter is evacuated, and the ſyſtem is freed from the bad conſequences which enſue on its ſtagnation in the habit. But even this is by no means equal to the common evacuation by ſtool; nor can all the attempts to ſupply the want of bile in the inteſtines by bitters and other ſtomachics reſtore the patient to his wonted appetite and vigour. If the pain be very violent, we muſt on all occaſions have recourſe to opiates; or if the blood has acquired a tendency to diſſolution, it muſt be counteracted by proper antiſeptics.

If the diſeaſe goes off, its return muſt be prevented by a courſe of tonic medicines, particularly the Peruvian bark and antiſeptics: but we can by no means be certain that the jaundice will not return, and that at any interval; for there may be a number of concretions in the gall-bladder, and though one hath paſſed, another may very quickly follow, and produce a new fit of jaundice; and thus ſome people have continued to be affected with the diſtemper, at ſhort intervals, during life.

In the Eaſt-Indies, mercury has been lately recommended as exceedingly efficacious in diſorders of the liver, eſpecially thoſe which follow intermitting and remitting fevers. Dr Monro, in his obſervations on the means of preſerving the health of ſoldiers, acquaints us, that he has ſeen ſome icteric caſes which, he thought,

Impetigines.

received benefit from taking a few grains of *mercurius dulcis* at night and a purge next morning; and this repeated two or three times a-week.

Infants are ſubject to a temporary jaundice, commonly called the *gum*, ſoon after birth, the cauſe of which is not well underſtood. It differs remarkably from the common jaundice; as, in the latter, the diſeaſe is firſt diſcoverable in the white of the eyes; but though the ſkin of infants in the gum is all over yellow, their eyes always remain clear. The diſorder goes off ſpontaneouſly, or by the uſe of a gentle purgative or two.

357 CLASS IV. LOCALES.

Vitia, *Sauv.* Claſs I. *Lin.* Cl. XI. *Vog.* Cl. X. *Sag.* Cl. I.

Plagæ, *Sag.* Cl. II.
Morbi organici Auctorum.

358 Order I. DYSÆSTHESIÆ.

Dyſæſtheſiæ, *Sauv.* Cl. VI. Ord. I. *Sag.* Cl. IX. Ord. I.

359 Genus XCII. CALIGO.
The Cataract.

Caligo, *Sauv.* gen. 153. *Vog.* 288. *Sag.* gen. 259.
Cataracta, *Lin.* 109.

A *cataract* is an obſtruction of the pupil, by the interpoſition of ſome opaque ſubſtance which either diminiſhes or totally extinguiſhes the ſight. It is generally an opacity in the cryſtalline humour. In a recent or beginning *cataract*, the ſame medicines are to be uſed as in the *gutta ſerena;* and they will ſometimes ſucceed. But when this does not happen, and the cataract becomes firm, it muſt be couched, or rather extracted; for which operation, ſee Surgery.—Dr Buchan ſays he has reſolved a recent cataract by giving the patient ſome purges with calomel, keeping a poultice of freſh hemlock conſtantly upon the eye, and a perpetual bliſter on the neck.

There is, however, but little reaſon to ſuppoſe that theſe practices will frequently ſucceed. A reſolution can only be effected here by an abſorption of the opaque matter; and where this is poſſible, there is perhaps a better chance of its being effected by the agency of the electric fluid than by any other means. For this purpoſe electricity is chiefly applied under the form of the *electric aura*, as it has been called; but even this is very rarely ſucceſsful.

360 Genus XCIII. AMAUROSIS,
The Gutta Serena.

Amauroſis, *Sauv.* gen. 155. *Lin.* 110. *Vog.* 238. *Sag.* 261.
Amblyopia, *Lin.* 108. *Vog.* 236.

A *gutta ſerena* is an abolition of the ſight without any apparent cauſe or fault in the eyes. In every caſe it depends on an affection of ſome part of the optic nerve. But the affections which may produce this diſeaſe are of different kinds. When it is owing to a decay or waſting of the optic nerve, it does not admit of a cure; but when it proceeds from a compreſſion of the nerves by redundant humours, theſe may be in ſome meaſure drained off, and the patient relieved. For this purpoſe, the body muſt be kept open with the laxative mercurial pills. If the patient be young, and of a ſanguine habit, he may be bled. Cupping with ſcarifications on the back part of the head will likewiſe be of uſe. A running at the noſe may be promoted by volatile ſalts, ſtimulating powders, &c. But the moſt likely means of relieving the patient, are iſſues or bliſters kept open for a long time on the back part of the head, behind the ears, or on the neck; which have been known to reſtore ſight even after it had been for a conſiderable time loſt.—Should theſe fail, recourſe muſt be had to a mercurial ſalivation; or, what will perhaps anſwer the purpoſe better, 12 grains of the corroſive ſublimate mercury may be diſſolved in an Engliſh pint and a half of brandy, and a table-ſpoonful of it taken twice a-day, drinking half a pint of the decoction of ſarſaparilla after it.—Of late electricity has been much celebrated as efficacious, when no other thing could do ſervice, and here it has in ſome degree the ſame chance of ſucceſs as in other caſes of inſenſibility, depending on an affection of the nerves, in ſome of which it has certainly in particular caſes been of uſe.

Amauroſis.

In the amauroſis, Dr Porterfield obſerves, that it is of the utmoſt conſequence to know of how long ſtanding the diſeaſe has been; which is not always eaſily done if one eye only be affected. This is a very eſſential point; becauſe an amauroſis of long ſtanding is altogether incurable. Mr Boyle mentions the caſe of a man who had a cataract for ſeveral years without knowing it himſelf, though others did. He diſcovered it at laſt by happening to rub his ſound eye, and was ſurpriſed to find himſelf in the dark. When a perſon therefore has a gutta ſerena only in one of the eyes, he may think that the eye has but lately loſt the power of ſight; though this perhaps has been the caſe for ſeveral years. On the other hand, he may imagine that a recent diſeaſe of this kind is really of long ſtanding. But by inquiring at what time he firſt became ſubject to miſtakes in all actions that require the diſtance to be exactly diſtinguiſhed, as in pouring liquor into a glaſs, ſnuffing a candle, threading a needle, we may diſcover the age of the diſeaſe, and thence be aſſiſted to form a more juſt prognoſtic with reſpect to its cure. Dr Porterfield gives an inſtance of his conjecturing in this manner concerning the caſe of a young lady who had diſcovered a loſs of ſight in one of her eyes only the day before. The diſeaſe was thought to be of long ſtanding; but as the Doctor found that ſhe had only been ſubject to miſtakes of the kind abovementioned for about a month, he drew a favourable prognoſtic, and the diſeaſe was cured.

361 Genus XCIV, DYSOPIA.
Depraved Vision.

Amblyopia, *Sauv.* gen. 154. *Sag.* 258.

There are ſeveral ſpecies referred to this genus by Dr Cullen, *viz.*

1. *Dyſopia* Tenebrarum; 2. *Dyſopia* Luminis.—The former of theſe is properly the *nyctalopia*, or night-

blindneſs, of ancient authors. But amongſt both the Greek and Latin writers, there is a direct oppoſition in the uſe of this word *nyctalopia*; ſome ſaying it ſignifies "thoſe who *cannot* ſee by night," and others expreſs by it "thoſe who cannot ſee during the day, but during the *night*."—The difference in the account of this diſorder, as to its appearing in the night or in the day, is reconciled by conſidering it as of the intermitting kind: the difference then will conſiſt in the different times of its approach; ſo it may be called *periodical blindneſs*. Intermittents appearing in a variety of modes, and the ſucceſs of the bark in ſome inſtances of this ſort of blindneſs, both favour the opinion of its being an intermittent diſeaſe of the eyes; and this view has accordingly been taken of it by ſome late writers, particularly in ſome papers in the London Medical Obſervations, and Medical Tranſactions.

3. *Dyſopia* PROXIMORUM *(Preſbytia)*, or the defect of thoſe who *ſee only at too great diſtance*. 4. *Dyſopia* DISSITORUM *(Myopia)*, or the defect of thoſe who are *ſhortſighted*.—Theſe are diſorders which depend on the original ſtructure or figure of the eye, therefore admit of no cure. The inconveniences ariſing from them may, however, be in ſome meaſure remedied by the help of proper glaſſes, The former requires the aid of a convex, and the latter of a concave glaſs.

5. *Dyſopia* LATERALIS; a defect by which objects cannot be viewed diſtinctly but in an oblique poſition.—Thus, in viewing an object placed on the left, they turn their face and eye to the right, and *vice verſa*.—This diſorder may proceed from various cauſes both natural and accidental, ſome of which admit of no remedy. If it be occaſioned by a partial adheſion of the eye-lids, the hand of the ſurgeon is required: if by a tranſverſe poſition of the pupil, ſome mechanical contrivance is neceſſary. If it be owing to an *albugo* covering part of the pupil, or to a film rendering a portion of the cornea opaque, the remedies for theſe affections are to be here applied.

362 GENUS XCV. PSEUDOBLEPSIS.
IMAGINARY VISION of Objects which do not exiſt.

Suffuſio, *Sauv.* gen. 217. *Sag.* 329.
Phantaſma, *Lin.* 73. *Sag.* 289.

This very often takes place when the body is diſeaſed, and then the patient is ſaid to be delirious. Sometimes, however, in theſe caſes, it does not amount to delirium; but the perſon imagines he ſees gnats or other inſects flying before his eyes, or ſometimes, that every thing he looks at has black ſpots in it, which laſt is a very dangerous ſign. Sometimes alſo ſparks of fire appear before the eyes; which appearances are not to be diſregarded, as they frequently precede apoplexy or epilepſy. Sometimes, however people have been affected in this manner during life without feeling any other inconvenience. Such a diſorder can rarely if ever be cured.

363 GENUS XCVI. DYSECŒA.
DEAFNESS, or *Difficulty of Hearing*.

364 GENUS XCVII. PARACUSIS.
Depravation of HEARING,

Paracuſis, *Sauv.* gen. 159. *Sag.* 265.
Syrigmus, *Sauv.* gen. 219. *Sag.* 231.

The functions of the ear may be injured by wounds, ulcers, or any thing that hurts its fabric. The hearing may likewiſe be hurt by exceſſive noiſe; violent colds in the head; fevers; hard wax, or other ſubſtances ſticking in the cavity of the ear; too great a degree of moiſture or dryneſs of the ear. Deafneſs is very often the effect of old age, and is incident to moſt people in the decline of life. Sometimes it is owing to an original fault in the ſtructure or formation of the ear itſelf. When this is the caſe it admits of no cure; and the unhappy perſon not only continues deaf, but generally likewiſe dumb, for life.

When deafneſs is the effect of wounds or ulcers of the ears, or of old age, it is not eaſily removed. When it proceeds from cold applied to the head, the patient muſt be careful to keep his head warm, eſpecially in the night; he ſhould likewiſe take ſome gentle purges, and keep his feet warm, and bathe them frequently in lukewarm water at bed-time. When deafneſs is the effect of a fever, it generally goes off after the patient recovers. If it proceeds from dry wax ſticking in the ears, it may be ſoftened by dropping oil into them; afterwards they muſt be ſyringed with warm milk and water.

If deafneſs proceeds from dryneſs of the ears, which may be known by looking into them, half an ounce of the oil of ſweet almonds, and the ſame quantity of camphorated ſpirit of wine, or tincture of aſafœtida, may be mixed together, and a few drops of it put into the ear every night at bed-time, ſtopping them afterwards with a little wool or cotton. Some, inſtead of oil, put a ſmall ſlice of the fat of bacon into each ear which is ſaid to anſwer the purpoſe very well.—When the ears abound with moiſture, it may be drained of by an iſſue or ſeton, which ſhould be made as near the affected parts as poſſible.

Some, for the cure of deafneſs, recommend the gall of an eel mixed with ſpirit of wine, to be dropped into the ear; others, equal parts of Hungary-water and ſpirit of lavender. Etmuller extols amber and muſk; and Brookes ſays, he has often known hardneſs of hearing cured by putting a grain or two of muſk into the ear with cotton-wool. Where, however, an application with conſiderable ſtimulant power is neceſſary, camphorated oil, with the addition of a few drops of volatile alkaline ſpirit, may be conſidered as one of the beſt. It is proper however, to begin with a ſmall quantity of the alkali, increaſing it as the ear is found to bear it. In ſome inſtances, where deafneſs depends on a ſtate of inſenſibility in the nerves, electricity, particularly under the form either of ſparks or of the electric aura, has been employed with great ſucceſs. But theſe and other applications muſt be varied according to the cauſe of the diſorder.

Though ſuch applications may ſometimes be of ſervice, yet they much oftener fail, and frequently they do hurt. Neither the eyes nor ears ought to be tampered with; they are tender organs, and require a very delicate touch. For this reaſon, what we would chiefly recommend in deafneſs, is to keep the head warm. From whatever cauſe this diſorder proceeds, this is always proper; and more benefit has often been derived from it alone, in the moſt obſtinate caſes of deafneſs, than from any medicines whatever.

365 Genus XCVIII. ANOSMIA.

Defect of Smelling.

Anoſmia, *Sauv.* gen. 156. *Lin.* 113. *Vog.* 248. *Sag.* 262.

Cauſes. Morbid affections in the ſenſe of ſmelling, may be conſidered with reſpect to their cauſes, as ariſing from one of two ſources; either from ſome organic affection of the parts here principally concerned, or from a mere atonic ſtate of the parts without any obvious affection. The ſenſe of ſmelling may be diminiſhed or deſtroyed by various diſeaſes of the parts; as, the moiſture, dryneſs, inflammation or ſuppuration of that membrane which lines the inſide of the noſe commonly called the *olfactory membrane;* the compreſſion of the nerves which ſupply this membrane, or ſome fault in the brain itſelf at their origin. A defect, or too great a degree of ſolidity of the ſmall ſpongy bones of the upper jaw, the caverns of the forehead, &c. may likewiſe impair the ſenſe of ſmelling. It may alſo be injured by a collection of fetid matter in thoſe caverns, which keeps conſtantly exhaling from them. Few things are more hurtful to the ſenſe of ſmelling than taking great quantities of ſnuff.

Cure. When the noſe abounds with moiſture, after gentle evacuations, ſuch things as tend to take off irritation and coagulate the thin ſharp ſerum may be applied; as the oil of aniſe mixed with fine flour, camphire diſſolved in oil of almonds, &c. The vapours of amber, frankincenſe, gum-maſtic, and benjamin, may likewiſe be received into the noſe and mouth. For moiſtening the mucus when it is too dry, ſome recommend ſnuff made of the leaves of marjoram, mixed with oil of amber, and aniſeed; or a ſternutatory of calcined white vitriol, 12 grains of which may be mixed with two ounces of marjoram-water and filtrated. The ſteam or vapour of vinegar thrown upon hot iron received up the noſtrils is likewiſe of uſe for ſoftening the mucus, opening obſtructions, &c.

If there be an ulcer in the noſe, it ought to be dreſſed with ſome emollient ointment, to which, if the pain be very great, a little laudanum may be added. If it be a venereal ulcer, it is not to be cured without mercury. In that caſe, the ſolution of the corroſive ſublimate in brandy may be taken, as directed in the gutta ſerena. The ulcer ought likewiſe to be waſhed with it; and the fumes of cinnabar may be received up the noſtrils.

If there be reaſon to ſuſpect that the nerves which ſupply the organs of ſmelling are inert or want ſtimulating, volatile ſalts, ſtrong ſnuffs, and other things which occaſion ſneezing, may be applied to the noſe. The forehead may likewiſe be anointed with balſam of Peru, to which may be added a little of the oil of amber.

366 Genus XCIX. AGEUSTIA.

Defect of Tasting.

Ageuſtia, *Sauv.* gen. 157. *Sag.* 263.
Ageuſtia, *Lin.* 114.
Apogeuſis, *Vog.* 449.

Cauſe. This diſeaſe alſo may ariſe either from an organic affection, or an atonic ſtate of the parts. The taſte may be diminiſhed by cruſts, filth, mucus, aphthæ, pellicles, warts, &c. covering the tongue; it may be depraved by a fault of the ſaliva, which being diſcharged into the mouth, gives the ſame ſenſation as if the food which the perſon takes had really a bad taſte; or it may be entirely deſtroyed by injuries done to the nerves of the tongue and palate. Few things prove more hurtful either to the ſenſe of taſting or ſmelling than obſtinate colds, eſpecially thoſe which affect the head.

Cure. When the taſte is diminiſhed by filth, mucus, &c. the tongue ought to be ſcraped, and frequently waſhed with a mixture of water, vinegar, and honey, or ſome other detergent. When the ſaliva is vitiated, which ſeldom happens unleſs in fevers or other diſeaſes, the curing of the diſorder is the cure of this ſymptom. To relieve it, however in the mean time, the following practices may be of uſe: if there be a bitter taſte, it may be taken away by vomits, purges, and other things which evacuate bile: what is called a *nidorous taſte,* riſing from putrid humours, is corrected by the juice of citrons, oranges, and other acids: a ſalt taſte is cured by plentiful dilution with watery liquors: an acid taſte is deſtroyed by abſorbents and alkaline ſalts, as powder of oyſter-ſhells, ſalt of wormwood, &c.

When the ſenſibility of the nerves which ſupply the organs of taſte is diminiſhed, the chewing of horſe-radiſh, or other ſtimulating ſubſtances, will help to recover it.

Genus C. ANÆSTHESIA. 367

Defect of the Senſe of Feeling.

Sauv. gen. 161. *Lin.* 218. *Vog.* 267.

Cauſes, &c. This ſenſe may be hurt by any thing that obſtructs the nervous influence, or prevents its being regularly conveyed to the organs of touching, as preſſure, extreme cold, &c. It may likewiſe be hurt by too great a degree of ſenſibility, when the nerve is not ſufficiently covered by the cuticle or ſcarf-ſkin, or where there is too great a tenſion of it, or it is too delicate. Whatever diſorders the functions of the brain and nerves, hurts the ſenſe of touching. Hence it appears to proceed from the ſame general cauſes as palſy and apoplexy, and requires nearly the ſame method of treatment.

In a *ſtupor,* or defect of touching, which ariſes from an obſtruction of the cutaneous nerves, the patient muſt firſt be purged; afterwards ſuch medicines as excite the action of the nerves, or ſtimulate the ſyſtem, may be uſed. For this purpoſe, the ſpirit of hartſhorn, either by itſelf or combined with eſſential oils, horſe-radiſh, &c. may be taken inwardly; the diſordered parts, at the ſame time, may be frequently rubbed with freſh nettles or ſpirits of ſal ammoniac. Bliſters and ſinapiſms applied to the parts will likewiſe be of uſe; and alſo warm bathing, eſpecially in the natural hot-baths.

Order II. DYSOREXIÆ. 368

Sect. I. *APPETITUS ERRONEI.*

Moroſitates, *Sauv.* Claſs VIII. Order II. *Sag.* Claſs XIII. Order II.

Pathetici, *Lin.* Claſs V. Order II.
Hyperæſtheſes, *Vog.* Claſs VII.

369 Genus CI. BULIMIA.

Insatiable Hunger, or *Canine Appetite.*

Bulimia, *Sauv.* gen. 223. *Lin.* 79. *Sag.* gen. 335.
Bulimus, *Vog.* 296.
Addephagia, *Vog.* 297.
Cynorexia, *Vog.* 298.

This diſeaſe is commonly owing to ſome fault in the ſtomach, by which the aliments are thrown out too ſoon; and unleſs the perſon be indulged in his deſire for eating, he frequently falls into fainting fits. Sometimes it is attended with ſuch a ſtate of the ſtomach, that the aliment is rejected by vomit almoſt immediately after being ſwallowed; after which the appetite for food returns as violent as ever. But there are many circumſtances which ſeem to render it probable that it more frequently ariſes from a morbid condition of the ſecreted fluid poured into the ſtomach, by means of which the aliment is diſſolved. When the activity of this fluid is morbidly increaſed, it will both produce too ſudden a ſolution of the ſolid aliment, and likewiſe operate as a powerful and peculiar ſtimulus to the ſtomach, giving an uneaſy ſenſation, ſimilar to that which takes place in natural hunger. Such things are proper for the cure as may enable the ſtomach to perform its office: chalybeates and other tonics will generally be proper. In ſome, brandy drunk in a morning has been uſeful; and frequent ſmoking tobacco has relieved others. Oil, fat meat, pork, opiates, and in ſhort every thing which in a ſound perſon would be moſt apt to pall the appetite, may alſo be uſed as temporary expedients, but cannot be expected to perform a cure. In ſome, the pylorus has been found too large; in which caſe the diſeaſe muſt have been incurable.

370 Genus CII. POLYDIPSIA.

Excessive Thirst.

Polydipſia, *Sauv.* gen. 224. *Lin.* 80. *Vog.* 275 *Sag.* 336.

This is almoſt always ſymptomatic; and occurs in fever, dropſy, fluxes, &c. The cure is very generally obtained only by the removal of the primary diſeaſe; and it is beſt palliated by the gradual introduction of diluents: But when theſe are contraindicated, it may often be ſucceſsfully obviated by ſuch articles taken into the mouth as have effect in augmenting the flow of ſaliva.

371 Genus CIII. PICA.

Longing, or *Falſe Appetite.*

Pica, *Sauv.* gen. 222. *Sag.* 334.
Citta, *Lin.* 78.
Allotriophagia, *Vog.* 299.
Malacia, *Vog.* 300.

The pica is alſo very generally ſymptomatic of other diſeaſes, as of worms, chloroſis, pregnancy, &c.; and is therefore chiefly to be combated by the removal of the primary affection. It may, however, be obſerved, that peculiar longings occurring in certain diſeaſes, as for example in fevers, often point out a natural cure. The indulgence of ſuch appetites to a moderate degree is ſeldom productive of any inconvenience, and often followed by the beſt conſequences.—Hence there are ſome practitioners who think that ſuch craving ſhould very generally be indulged; particularly when the patient can aſſign no reaſon whatever for ſuch particular longings, but is merely prompted by an uncommon and inexplicable deſire.

Genus CIV. SATYRIASIS. 372

Satyriaſis, *Sauv.* gen. 228. *Lin.* 81. *Sag.* 340.

Satyriaſis is a violent deſire of venery in men, even ſo that reaſon is depraved by it. The pulſe is quick, and the breathing ſhort; the patient is ſleepleſs, thirſty, and loathes his food; the urine is evacuated with difficulty, and a fever ſoon comes on. Theſe ſymptoms, however, are probably not ſo much the conſequence of ſatyriaſis, as merely concomitant effects reſulting from the ſame cauſe. And indeed this affection is moſt frequently the concomitant of a certain modification, of inſanity. The nature and cauſe of this affection are in moſt inſtances very little aſcertained; but as far as we are acquainted with the treatment, it agrees very much with the affection next to be mentioned, which, of the two, is the moſt common occurrence.

Genus CV. NYMPHOMANIA. 373

Furor Uterinus.

Nymphomania, *Sauv.* 229. *Sag.* 341.
Satyriaſis, *Lin.* 81.

The *furor uterinus* is in moſt inſtances either a ſpecies of madneſs or an high degree of hyſterics. Its immediate cauſe is a preternatural irritability of the uterus and pudenda of women (to whom the diſorder is proper), or an unuſual acrimony of the fluids in theſe parts.—Its preſence is known by the wanton behaviour of the patient: ſhe ſpeaks and acts with unreſtrained obſcenity; and as the diſorder increaſes, ſhe ſcolds, cries, and laughs, by turns. While reaſon is retained, ſhe is ſilent, and ſeems melancholy, but her eyes diſcover an unuſual wantonneſs. The ſymptoms are better and worſe until the greateſt degree of the diſorder approaches, and then by every word and action her condition is too manifeſt.—In the beginning a cure may be hoped for; but if it continue, it degenerates into a mania.—In order to the cure, blood-letting is commonly had recourſe to in proportion to the patient's ſtrength. Camphor in doſes of 15 or 20 grains, with nitre, and ſmall doſes of the tincture of opium, ſhould be repeated at proper intervals. Some venture to give ceruſa acetata in doſes from three to five grains. Beſides bleeding, cooling purges ſhould alſo be repeated in proportion to the violence of ſymptoms, &c. What is uſeful in maniacal and hypochondriac diſorders, is alſo uſeful here, regard being had to ſanguine or phlegmatic habits, &c. When the delirium is at the height, give opiates to compoſe; and uſe the ſame method as in a phrenitis or a mania. Injections of barley-water, with a ſmall quantity of hemlock-juice, according to Riverius, may be frequently thrown up into the uterus:

Dyſorexiæ

this is called *ſpecific*; but matrimony, if poſſible, ſhould be preferred. For although this cannot be repreſented as a cure for the diſeaſe when in an advanced ſtate, yet there is reaſon to believe that it has not unfrequently prevented it where it would otherwiſe have taken place.

374

GENUS CVI. NOSTALGIA.

Vehement DESIRE *of* REVISITING *one's* COUNTRY.

Noſtalgia, *Sauv.* gen. 226. *Lin.* 83. *Sag.* 338.

This is to be reckoned a ſpecies of melancholy; and unleſs it be indulged, it very commonly proves not only incurable but even fatal. Although it cannot be conſidered as altogether peculiar to any nation, yet it is obſerved to be much more frequent with ſome than with others; and it has particularly been remarked among Swiſs ſoldiers in the ſervice of foreign ſtates.

SECT. II. *APPETITUS DEFICIENTES.*

Anepithymiæ, *Sauv.* Claſs VI. Ord. II. *Sag.* IX. Ord. II.
Privativi, *Lin.* Claſs VI. Order III.
Adynamiæ, *Vog.* Claſs VI.

375

GENUS CVII. ANOREXIA.

Want of APPETITE.

Anorexia, *Sauv.* gen. 162. *Lin.* 116. *Vog.* 279. *Sag.* 268.

The anorexia is ſymptomatic of many diſeaſes, but ſeldom appears as a primary affection; and it is very generally overcome only by the removal of the affection on which it depends.

376

GENUS CVIII. ADIPSIA.

Want of THIRST.

Adipſia, *Sauv.* gen. 163. *Lin.* 117. *Vog.* 281. *Sag.* 269.

This by Dr Cullen is reckoned to be always ſymptomatic of ſome diſtemper affecting the *ſenſorium commune*.

377

GENUS CIX. ANAPHRODISIA.

Impotence to VENERY.

Anaphrodiſia, *Sauv.* gen. 164. *Sag.* 270.
Atecnia, *Lin.* 119.
Ageneſia, *Vog.* 283.

For this, ſee the article IMPOTENCE in the alphabetical order.

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ORDER III. DYSCINESIÆ.

379

GENUS CX. APHONIA.

Loſs of VOICE.

Aphonia, *Sauv.* gen. 166. *Lin.* 115. *Vog.* 253. *Sag.* 272.

The loſs of voice may proceed from various cauſes. If one of the recurrent nerves, which are formed by the *par vagum* and the *nervus acceſſorius*, and reach the larynx, be cut the perſon is capable of only as it were a half-pronunciation; but if both be cut, the ſpeech and voice are both loſt. The loſs of ſpeech happening in hyſteric patients is alſo called *aphonia*; but more properly that loſs of ſpeech is thus named which depends on ſome fault of the tongue.

Aphonia.

Seeing that the motion of any part is deſtroyed, or leſſened at leaſt, by the interception of the nervous fluid in its paſſage thither, and that the nerves deſtined for the motion of the tongue ariſe principally from the fifth pair, it appears that the ſeat of this diſorder is in the ſaid fifth pair of nerves, and that the immediate cauſe is a diminution or total deſtruction of the nervous power in them. Hence a palſy of the tongue, which is either antecedent or ſubſequent to hemiplectic or apoplectic diſorders, demand our utmoſt attention.

If an aphonia appears alone, it generally beſpeaks an approaching hemiplegia or apoplexy; but if it ſucceed theſe diſorders, and is complicated with a weak memory and a ſluggiſhneſs of the mental powers, it threatens their return. That aphony uſually terminates the beſt which proceeds from a ſtagnation of ſerous humours compreſſing the branches of the fifth pair of nerves, which run to the tongue; but it is no leſs afflictive to the patient, and is very obſtinate of cure.

Other cauſes of this diſorder are, the ſtriking in of eruptions on the ſkin, a congeſtion of blood in the fauces and tongue, obſtructed periodical evacuations in plethoric habits, ſpaſmodic affections, worms, a crum of bread falling into the larynx, fear, too free an uſe of ſpirituous liquors; alſo whatever deſtroys the ligaments which go from the arytænoid to the thyroid cartilages, will deſtroy the voice.

The *prognoſtics* vary according to the cauſe or cauſes. That ſpecies which is owing immediately to ſpaſms, ſoon gives way on the removal of them. If a palſy of the tongue be the cauſe, it is very apt to return, tho' relieved, but often continues incurable.

In order to the *cure*, we muſt endeavour firſt to remove whatever obſtructs the influx of the nervous fluid into the tongue, and ſecondly to ſtrengthen the weak parts. Theſe general intentions, in all caſes, being regarded, the particular cauſes muſt be removed as follows:

If worms be the cauſe, antiſpaſmodics may give preſent relief; but the cure depends on the deſtruction or expulſion of the animals themſelves. In caſe of a congeſtion of blood about the head, bleeding and nitrous medicines are to be uſed.—That ſpecies of aphony which remains after the ſhock of an hemiplegia or apoplexy, requires bliſters to be applied to the nape of the neck; other means are rarely effectual.—If ſpaſmodic conſtrictions about the fauces and tongue be the cauſe, external paregorics are of the greateſt ſervice, anodyne antiſpaſmodics may be laid under the tongue, and the feet bathed in warm water; carminative clyſters alſo are uſeful.—When a palſy of the tongue produces this complaint, evacuations, according to the patient's habit, muſt be made, and warm nervous medicines muſt be externally applied, and internally adminiſtered; bliſters alſo ſhould be placed between the ſhoulders.—In caſe of repelled cuticular eruptions, ſudorifics ſhould be given, and the patient's drink ſhould be warm. The ſpiritus ammoniæ ſuccinatus, or vinum antimonii, may be employed either in combination

tion with other articles or by themſelves, and given, at proper diſtances of time, in the patient's drink, or on a lump of ſugar.—Sometimes the ſerum flows ſo rapidly to the fauces and adjacent parts, in a ſalivation, as to deprive the patient of all power to ſpeak; in this caſe diaphoretics and laxatives, with a forbearance of all mercurials, are the ſpeedieſt remedies.

380 GENUS CXI. MUTITAS,

DUMBNESS.

Mutitas, *Sauv.* gen. 165. *Vog.* 257. *Sag.* 271.

Dumb people are generally born deaf; in which caſe the diſtemper is incurable by medicine: though even ſuch people may be taught not only to read and write, but alſo to ſpeak and to underſtand what others ſay to them. For ſome obſervations on the method in which this has been accompliſhed, we may refer the reader to the article DUMBNESS in the alphabetical order. But in theſe caſes, admitting of cure in the manner above alluded to, the dumbneſs proceeds principally, if not ſolely, from the deafneſs. For when it proceeds from a defect of any of the organs neceſſary for ſpeech, the tongue for inſtance, it is always incurable; but if it ariſe from a palſy, the medicines applicable in that caſe will ſometimes reſtore the ſpeech.

381 GENUS CXII. PARAPHONIA.

Change in the Sound of the VOICE.

Paraphonia, *Sauv.* gen. 168.
Cacophonia, *Sag.* 274.
Raucedo, *Lin.* 146.
Raucitas, *Vog.* 252.
Aſaphia, &c. *Vog.* 250, 251, 254, 255, 256.

The voice may be changed from various cauſes. In males it becomes much more hard about the time of puberty; but this can by no means be reckoned a diſeaſe. In others it proceeds from a catarrh, or what we call a *cold;* it ariſes alſo from affections of the noſe and palate, as polypi, ulcers, &c. in which caſe the cure belongs properly to SURGERY. In ſome it ariſes from a laxity of the *velum pendulum palati* and glottis, which makes a kind of ſnoring noiſe during inſpiration. The cure of this laſt caſe is to be attempted by tonics and ſuch other medicines as are of ſervice in diſeaſes attended with laxity.

382 GENUS CXIII. PSELLISMUS.

Defect in PRONUNCIATION.

Pſelliſmus, *Sauv.* gen. 167. *Lin.* 138. *Sag.* 273.
Traulotis, &c. *Vog.* 258. 59. 260. 261.

Of this diſeaſe (if ſuch it may be called), there are many different kinds. Some cannot pronounce the letter S; others labour under the ſame difficulty with R, L, M, K, &c.; while ſome who can with ſufficient eaſe pronounce all the letters, yet repeat their words, or the firſt ſyllables of them, in ſuch a ſtrange manner, that they can ſcarce be underſtood. Very frequently theſe defects ariſe entirely from habit, and may then be got the better of by thoſe who have the reſolution to attempt it; as we are told that Demoſthenes the celebrated orator got the better of a habit of ſtammering by declaiming with pebbles in his mouth. Sometimes, however, pronunciation may be impeded by a wrong conformation of the tongue or organs of ſpeech; and then it cannot by any pains whatever be totally removed.

383 GENUS CXIV. STRABISMUS.

SQUINTING.

Strabiſmus, *Sauv.* gen. 116. *Lin.* 304. *Vog.* 514. *Sag.* 222.

Deſcription. This diſeaſe ſhows itſelf by an uncommon contraction of the muſcles of the eye; whereby the axis of the pupil is drawn towards the noſe, temples, forehead, or cheeks, ſo that the perſon cannot behold an object directly.

Cauſes, Prognoſis, &c. I. This diſeaſe may proceed from cuſtom and habit; while in the eye itſelf, or in its muſcles, nothing is preternatural or defective.

Thus children by imitating thoſe that ſquint, and infants by having many agreeable objects preſented to them at once, which invite them to turn one eye to one and the other eye to another, do frequently contract a habit of moving their eyes differently, which afterwards they cannot ſo eaſily correct. Infants likewiſe get a cuſtom of ſquinting by being placed obliquely towards a candle, window, or any other agreeable object capable of attracting their ſight; for though, to ſee the object, they may at firſt turn both eyes towards it; yet becauſe ſuch an oblique ſituation is painful and laborious, eſpecially to the moſt diſtant eye, they ſoon relax one of the eyes, and content themſelves with examining it with the eye that is next it; whence ariſes a diverſity of ſituation and a habit of moving the eyes differently.

In this caſe, which may admit of a cure if not too much confirmed, it is evident, that objects will be ſeen in the ſame place by both eyes, and therefore muſt appear ſingle as to other men; but becauſe, in the eye that ſquints, the image of the object to which the other eye is directed falls not on the moſt ſenſible and delicate part of the retina, which is naturally in the axis of the eye, it is eaſy to ſee that it muſt be but faintly perceived by this eye. Hence it is, that while they are attentive in viewing any object, if the hand be brought before the other eye, this object will be but obſcurely ſeen, till the eye change its ſituation, and have its axis directed to it; which change of ſituation is indeed very eaſy for them, becauſe it depends on the muſcles of the eyes, whoſe functions are entire; but, by reaſon of the habit they have contracted of moving their eyes differently, the other eye is at the ſame time frequently turned aſide, ſo that only one at a time is directed to the object.

That all this may be the better perceived; for an object, cauſe them to look at the image of the upper part of your noſe in a plain mirror, while you ſtand directly behind them, to obſerve the direction of their eyes.

II. The *ſtrabiſmus* may proceed from a fault in the firſt conformation, by which the moſt delicate and ſenſible part of the retina is removed from its natural ſituation, which is directly oppoſite to the pupil, and is placed a little to a ſide of the axis of the eye; which obliges them to turn away the eye from the object they would view, that its picture may fall on this moſt ſenſible part of the organ.

When this is the caſe, the diſeaſe is altogether incurable, and the phænomena that ariſe therefrom differ in nothing from the phænomena of the former caſe, excepting only that here. 1. The object to which the eye is not directed will be beſt ſeen: which is the reverſe of what happens when this diſeaſe ariſes barely from habit and cuſtom. 2. No object will appear altogether clear and diſtinct: for all objects to which the eye is directed, by having their image painted in the retina at the axis of the eye, where it is not very ſenſible, will be but obſcurely ſeen; and objects that are placed ſo far to a ſide of the optic axis as is neceſſary for making their image fall on the moſt ſenſible and delicate part of the retina, muſt appear a little confuſed, becauſe the ſeveral pencils of rays that come therefrom fall too obliquely on the cryſtalline, to be accurately collected in ſo many diſtinct points of the retina; though it muſt be acknowledged, that this confuſion will, for the moſt part, be ſo ſmall as to eſcape unobſerved.

III. This diſeaſe may proceed from an oblique poſition of the cryſtalline, where the rays that come directly to the eye from an object, and that ought to converge to the point of the retina, which is in the axis of the eye, are, by reaſon of the obliquity of the cryſtalline, made to converge to another point on that ſide of the viſual axis where the cryſtalline is moſt elevated; and therefore the object is but obſcurely ſeen, becauſe its image falls not on the retina at the axis of the eye, where it is moſt ſenſible: But the rays that fall obliquely on the eye, will after refraction, converge to this moſt ſenſible part of the retina; and, by converging there, muſt impreſs the mind with a clearer idea of the object from whence they came. It is for this reaſon that the eye never moves uniformly with the other, but turns away from the object it would view, being attentive to the object to which it is not directed. When this is the caſe, it is in vain to expect any good from medicine.

The ſymptoms that naturally ariſe from it are, 1. The object to which the eye is directed will be but faintly ſeen, becauſe its image falls on the retina where it is not very ſenſible. 2. The object to which the eye is not directed, by having its image painted on the retina at the axis of the eye, will be clearly perceived. But, 3. This ſame object muſt appear ſomewhat indiſtinct, becauſe the pencils of rays that flow from it are not accurately collected in ſo many diſtinct points in the retina, by reaſon of their oblique incidence on the cryſtalline. 4. It muſt be ſeen, not in its proper place, but thence tranſlated to ſome other place ſituated in the axis of viſion. And, 5. Being thus tranſlated from its true place, where it is ſeen by the other eye that does not ſquint, it muſt neceſſarily appear double; and the diſtance between the places of its appearance will be ſtill greater, if the cryſtalline of the other eye incline to the contrary ſide.

IV. This diſeaſe may ariſe from an oblique poſition of the cornea; which, in this caſe, is generally more arched and prominent than what it is naturally.

When the eye has this conformation, no object to which it is directed can be clearly ſeen, becauſe its image falls not on the retina at the axis of the eye; and therefore the eye turns aſide from the object it would view, that its image may fall on the moſt ſenſible part of the retina.

When the ſtrabiſmus proceeds from this cauſe, the prognoſtic and the phænomena that attend it will be much the ſame as in the caſe immediately preceding; from which nevertheleſs it may be diſtinguiſhed by the obliquity of the cornea, which is manifeſt to the ſenſes; and if the cornea be alſo more arched and prominent than what it is naturally, which is commonly the caſe, the eye will alſo be ſhort-ſighted.

V. This want of uniformity in the motions of our eyes, may ariſe from a defect, or any great weakneſs or imperfection, in the ſight of both or either of the eyes; and this, according to Dr Porterfield, is the moſt common cauſe of this diſeaſe. The prognoſtic in this caſe is the ſame with that of the diſeaſe from which it proceeds.

VI. Another cauſe from which the ſtrabiſmus may proceed, lies in the muſcles that move the eye. When any of thoſe muſcles are too ſhort or too long, too tenſe or too lax, or are ſeized with a ſpaſm or paralyſis their equilibrium will be deſtroyed, and the eye will, be turned towards or from that ſide where the muſcles are faulty.

In this caſe, the diſeaſe frequently yields to medicine, and therefore admits of favourable prognoſtic; excepting only when, by a fault in the firſt conformation, any of the muſcles are longer or ſhorter than their antagoniſt; in which caſe, if ever it ſhould happen, no medicine can be of any uſe.

As to what concerns the optical phænomena, they are the ſame here as in caſe firſt: only when the diſeaſe commences not till, by cuſtom and habit, the uniform motion of the eyes has been rendered neceſſary, all objects do for ſome time appear double; but in time they appear ſingle.

Laſtly. This want of uniformity in the motions of our eyes may proceed from a preternatural adheſion or attachment to the eye-lids: of this we have an inſtance in Langius. And that the ſame thing may alſo be occaſioned by a tumor of any kind within the orbit, preſſing the eye aſide, and reſtraining it from following the motions of the other, is ſo evident, that inſtances need not be brought to prove it. Here alſo the caſe may admit of a favourable prognoſtic; and as for what concerns the optical phænomena they muſt be the ſame as in the caſe immediately preceding.

The *cure*. in confirmed caſes, is to be effected by mechanical contrivances, by which the perſon may be obliged to look ſtraight upon objects, or not ſee them at all; or at leaſt that he may ſee with uneaſineſs and confuſedly when he ſquints. In the 68th volume of the Philiſophical Tranſactions we have an account of a confirmed caſe of ſquinting of a very uncommon kind. The patient was a boy of five years old, and viewed every object which was preſented to him with but one eye at a time. If the object was preſented on his right ſide, he viewed it with his left eye; and if it was preſented on his left ſide, he viewed it with his right eye. He turned the pupil of that eye which was on the ſame ſide with the object in ſuch a direction that the image of the object might fall on that part of the bottom of the eye where the optic nerve enters it. When an object was held directly before him, he turned his head a little to one ſide, and obſerved it with but one eye, viz. that moſt diſtant from the object, turning away the other in the manner above deſcribed; and when he became tired of obſerving it with that eye, he turned his head the contrary way, and obſerved it with the other eye alone, with equal facility; but never turned the axis of both eyes on it at the ſame time. He ſaw letters which were written on bits of paper, ſo as to name them with equal eaſe, and at equal diſtances, with one eye as with the other. There was no perceptible difference in the diameters of the iriſes, nor in the contractility of them after having covered his eyes from the light. Theſe obſervations were carefully made by writing ſingle letters on ſhreds of paper, and laying wagers with the child that he could not read them when they were preſented at certain diſtances and in certain directions.

As from theſe circumſtances it appeared that there was no defect in either eye, which is frequently the caſe with perſons who ſquint, and hence that the diſeaſe was ſimply a depraved habit of moving his eyes, the diſeaſe ſeemed capable of a cure. A paper gnomon was made for this purpoſe, and fixed to a cap; and when this artificial noſe was placed over his real noſe, ſo as to project an inch between his eyes, the child, rather than turn his head ſo far to look at oblique objects, immediately began to view them with that eye which was next to them. But having the misfortune to loſe his father ſoon after this method was begun to be followed, the child was neglected for ſix years, during which time the habit was confirmed in ſuch a manner as ſeemed to leave little room to hope for a cure. The ſame phyſician, however, being again called, attempted a ſecond time to remove the deformity by a ſimilar contrivance. A gnomon of thin braſs was made to ſtand over his noſe, with a half circle of the ſame metal to go round his temples: theſe were covered with black ſilk, and by means of a buckle behind his head, and a croſs-piece over the crown of his head, this gnomon was worn without any inconvenience, and projected before his noſe about two inches and an half. By the uſe of this machine he ſoon found it leſs inconvenient to view all oblique objects with the eye next to them inſtead of the eye oppoſite to them.

After this habit was weakened by a week's uſe of the gnomon, two bits of wood, about the ſize of a gooſe-quill, were blackened all but a quarter of an inch at their ſummits; theſe were frequently preſented to him to look at, one being held on one ſide the extremity of his black gnomon, and the other on the other ſide of it. As he viewed theſe, they were gradually brought forwards beyond the gnomon, and then one was concealed behind the other: by theſe means, in another week, he could bend both his eyes on the ſame object for half a minute together, and by continuing the uſe of the ſame machine, he was in a very fair way of being cured when the paper was written.

Dr Darwin, who writes the hiſtory of the above caſe, adds, that all the other ſquinting people he had occaſion to attend, had one eye much leſs perfect than the other theſe patients, ſays he, are certainly curable by covering the beſt eye many hours in a day, as by a more frequent uſe of the weak eye, it not only acquires a habit of turning to the objects which the patient wiſhes to ſee, but gains at the ſame time a more diſtinct viſion; and the better eye at the ſame time ſeems to loſe ſomewhat in both theſe reſpects, which alſo facilitates the cure.

GENUS CXV. CONTRACTURA. 384

Contractions of the LIMBS.

Contractura, *Sauv.* gen. 119. *Lin.* 299. *Sag.* 225.
Obſtipitas, *Sauv.* gen. 11.
Caput obſtipum, *Vog.* 513.
Digitium, *Vog.* 221.

The contraction of various muſcles of the body is generally the conſequence of ſome other diſeaſe, as the rheumatiſm, gout, ſcurvy, or palſy, eſpecially that ſpecies of the latter which follows the *colica Pictonum.* It is exceedingly difficult of cure; though the warm medicinal waters are much recommended, and have ſometimes done great ſervice. Of late electricity has been found to perform ſurpriſing cures in this way.

ORDER IV. APOCENOSES. 385

Apocenoſes, *Vog.* Claſs II. Ord. II.
Fluxus, *Sauv.* Claſs IX. *Sag.* Claſs V.
Morbi evacuatorii, *Lin.* Claſs IX.

GENUS CXVI. PROFUSIO. 386

FLUX of BLOOD

Profuſio, *Lin.* 239.
Hæmorrhagia, *Vog.* 81. *Boerh.* 218.

The diſeaſe commonly known by the name of *bloody-flux*, is the putrid or contagious dyſentery, a diſeaſe which has already been treated of. But independent of the diſcharge of blood which then takes place, hæmorrhagy may take place from the alimentary canal as well as from other parts of the ſyſtem. In ſuch inſtances, however, if we except the place from which the diſcharge occurs, the phenomena are very much the ſame as in menorrhagia, hæmoptyſis, and other hæmorrhagies already treated of; while the diſeaſe is to be combated on the ſame principles and by the ſame remedies.

GENUS CXVII. EPHIDROSIS. 387

Exceſſive SWEATING.

Ephidroſis, *Sauv.* gen. 258. *Sag.* gen. 194.
Sudor, *Lin.* 208.
Hydropedeſis, *Vog.* 121.

This is generally ſymptomatic; and occurs in almoſt all fevers, but eſpecially in the latter ſtages of the hectic. Sometimes it is a primary diſeaſe, ariſing merely from weakneſs; and then eaſily admits of a cure by the uſe of the Peruvian bark, the cold bath, and other tonics.

GENUS CXVIII. EPIPHORA. 388

FLUX of the LACHRYMAL HUMOUR.

Epiphora, *Sauv.* gen. 259. *Lin.* 172. *Vog.* 99. *Sag.* 195.

THIS by Sauvages is deſcribed as an involuntary effuſion of tears without any remarkable itching, heat, or pain. It follows long-continued opthalmias; or it may be occaſioned by immoderate ſtudy, or any thing that weakens the eyes: hence it comes on about the age of 50 years, when the eyeſight naturally becomes weak. It in general grows worſe in the winter-time, and is very hard to cure. Some authors recommend purgatives, and bliſters on the nape of the neck, in order to draw off the abundant humours; but as the diſeaſe evidently proceeds from weakneſs, it would rather ſeem proper to purſue a contrary method. Sauvages recommends to the patients to abſtain from ſtudy, wine, and ſalted meats; and alſo to avoid ſmoke or wind, and at night to foment the eyes with an infuſion of four cloves in two ounces of proof-ſpirit.—Hungary water, roſe water with white vitriol diſſolved in it, &c. have alſo been recommended.

389 Genus CXIX. PTYALISMUS.

Salivation.

Ptyaliſmus, *Sauv.* gen. 261. *Lin.* 176. *Vog.* 103. *Sag.* 197.

A ſalivation is often ſymptomatic, but rarely a primary diſeaſe. Dr Cullen is of opinion, that when the latter happens to be the caſe, it ariſes from laxity; and then is to be cured by aſtringents and tonics. In the Medical Tranſactions we have the following account of a ſalivation brought on by a foreign ſubſtance irritating one of the parotid glands.

In the month of April 1751, a young lady about the age of 16 years, of a delicate habit, but ſubject to no particular complaints, perceived the beginning of a diſeaſe which afterwards proved moſt obſtinate and loathſome, *viz.* an inceſſant ſpitting. The quantity of this diſcharge was different at different times, varying from one pint to two pints and an half in 24 hours. As to its quality, it ſeemed to be no other than the ordinary ſecretion of the ſalival glands. By ſo large and conſtant an evacuation, her ſtrength became extremely impaired, and the moſt efficacious medicines had proved uſeleſs. She had taken large quantities of the Peruvian bark, both alone and combined with preparations of iron: and afterwards the fetid gums, opium, amber, alum, and the Neville-Holt-water, had in ſucceſſion been given her. In the mean time an exact regimen had been preſcribed: ſhe had been ordered to ride conſtantly; and to confine herſelf to a mucilaginous diet, ſuch as veal, calve's feet, &c. Likewiſe a gently opening medicine had now and then been interpoſed. The diſeaſe ſtill continued unaltered, ſhe had afterwards tried the *tinctura ſaturnina*; and had, at the ſame time, been encouraged to chew the Peruvian bark, and to ſwallow the ſaliva. But all theſe attempts had been vain; and after ſhe had taken ſome or other of the medicines abovementioned until the end of September 1753, namely, above two years, it appeared to her phyſician, Sir George Baker, unreaſonable to expect relief in ſuch a caſe from any internal medicines whatever.

He now conceived a ſuſpicion, that ſome extraneous body having accidentally found its way into the *meatus auditorius*, might poſſibly be the cauſe of this extraordinary ſecretion, by keeping up a continued irritation in the parotid glands. With this view he examined her ears, and extracted from them a quantity of fetid wool. How, or when, it came thither, no account could be given.

To this ſubſtance he attributed the beginning of the ſalivation, notwithſtanding that the diſeaſe did not immediately abate on the removal of the wool; as it appeared to be no improbable ſuppoſition that the diſcharge might be continued by the force of habit, though the original cauſe no longer remained.

It ſeemed therefore expedient to introduce ſome other habit, in the place of the increaſed ſecretion of ſaliva; which habit might afterwards be gradually left off. With this intention, he prevailed on the patient to chew perpetually a little dry bread, and to ſwallow it with her ſpittle. In a few weeks, it became neceſſary for her to chew the bread only at certain hours in the day; and thus, after two months, ſhe became entirely free from a moſt diſguſtful and tedious diſorder.

It is worthy of obſervation, that, at firſt, the ſwallowing of ſo much ſaliva frequently occaſioned a nauſea; and that then, for a few hours, ſhe was obliged to ſpit it out as uſual; and that, during the greateſt part of the time, when ſhe chewed the bread, ſhe had a ſtool or two every day more than common.

Genus CXX. ENURESIS. 390

An involuntary Flux *of* Urine.

Enureſis, *Sauv.* gen. 264. *Lin.* 195. *Vog.* 113. *Sag.* 200.

This is a diſtemper which frequently affects children, otherwiſe healthy, when aſleep; and is extremely diſagreeable. Often it is merely the effect of lazineſs, and may be driven off by proper correction; but ſometimes it proceeds from an atony or weakneſs of the ſphincter of the bladder. Many ridiculous cures have been preſcribed for it, and among the reſt fieldmice dried and powdered. Tonics are frequently of uſe; but ſometimes the diſtemper proves obſtinate, in ſpite of every thing we can uſe. In the London Medical Obſervations we find bliſters much recommended in this diſeaſe, when applied to the region of the os ſacrum. A girl of 13 years of age had been ſubject to an enureſis for four years. She could retain her water but a very little time in the day-time, but it flowed continually in the night. She had taken Peruvian bark and elixir of vitriol in conſiderable quantities; alſo Valerian and the volatile julep, without effect. She was ſeverely threatened, as the phyſician ſuſpected it might ariſe from a bad habit; but this producing no effect, a bliſter was applied to the os ſacrum, which in 24 hours totally removed the diſeaſe. A man aged 32, having been ſeized with an incontinence of urine and palſy of the lower extremities in conſequence of taking a quack medicine, was cured of the incontinence of urine in 24 hours by one bliſter and of the palſy itſelf by another. A woman of 50 having been ſeized with an enureſis and paralytic affection of the right thigh and leg in conſequence of a ſtrain, was cured of both by a ſingle bliſter. Several other caſes are there mentioned, by which the power of bliſters in removing this diſtemper ſeems to exceed that of every other medicine whatever.

391 ## GENUS CXXI. GONORRHOEA.

Gonorrhœa, *Sauv.* gen. 208. *Lin.* 200. *Vog.* 118. *Sag.* 204.

THE gonorrhœa is a flux of viſcid matter of various colours, from the urethra in men and the vagina in women. It commonly proceeds from coition with a perſon infected with the venereal diſeaſe, and is one of the moſt common forms under which that diſeaſe ſhows itſelf.

Deſcription. The firſt ſymptoms of the diſeaſe in men are commonly a ſenſation at the end of the penis not unlike a flea-bite, together with a fullneſs of the lips of the urethra, and ſome degree of tenſion in the penis, the urinary canal feeling as if tightened, and the urine flowing in a ſmall and unequal ſtream: a little whitiſh mucus is to be ſeen about the orifice of the urethra, and oozing from it when ſlightly preſſed, eſpecially if the preſſure be made on the ſpot where the ſoreneſs is moſt felt. The diſcharge ſoon increaſes in quantity, and varies in its colour according to the degree of inflammation. The patient feels a ſenſation of heat and pain in evacuating his urine, particularly at certain ſpots of the urethra, and above all towards its orifice; and the involuntary erections to which he is ſubjected from the ſtimulus, particularly when warm in bed, occaſion a diſtortion or curvative of the penis, attended with exquiſite pain. When the inflammation is violent, the glans appears tumid and tranſparent, the tenſion extends through the whole of the penis, the perinæum is affected with ſwelling and redneſs, and even the loins, buttocks, and anus, ſympathize and afford a very uneaſy ſenſation. Sometimes the prepuce inflames about the end of the penis, and cannot be drawn back, occaſioning what is called a *phymoſis*; at other times, as in the *paraphymoſis*, it remains in an inflamed ſtate below the glans, ſo that it cannot be drawn forwards; and, if the ſtricture and inflammation be violent, may terminate in gangrene. Now and then, eſpecially when there is a phymoſis, we may perceive a hard chord extending along the back of the penis. This is an inflamed lymphatic, and may be conſidered as a prelude to a bubo. When, however, a bubo does appear, almoſt univerſally ſome ulceration is previouſly to be diſcovered about the præputium, or glans penis; which gives ground to preſume that ſome other contagious matter beſides that of gonorrhœa may have been applied to the urethra. For it is certain that matter capable of communicating the contagion of gonorrhœa to a female, is often copiouſly applied to the whole glans penis of a male for ſeveral days together without giving either ulceration or bubo.

In mild caſes, the ſeat of the diſeaſe is in the urethra, not far from its orifice; but it frequently happens that the virus inſinuates itſelf much higher up, ſo as to affect Cowper's glands, the proſtate, and parts very near to the neck of the bladder.

In the generality of caſes, the inflammation goes on increaſing for ſeveral days, commonly for a week or a fortnight; after which the ſymptoms begin to abate; and the running, when left to itſelf, gradually leſſens in quantity, and becomes whiter and thicker, till at length it totally ſtops. The colour of the mucus, however, is by no means a certain guide in theſe caſes: for in many patients it is of a yellowiſh, and ſometimes of a greeniſh hue to the very laſt; but in general it becomes more conſiſtent towards the cloſe of the diſeaſe.

In women, the external parts of generation being fewer and more ſimple, the diſeaſe is leſs complicated than in men. Sometimes the vagina only is affected; and when this happens, the ſymptoms are very trifling: but in general it comes on with an itching and ſenſation of heat as in the other ſex; and is attended with inflammation of the nymphæ, inſide of the *labia*, *clitoris*, *carunculæ myrtiformes*, the orifice and ſometimes the whole of the *meatus urinarius*. Very often the deep-ſeated glands of the vagina are affected, and it is ſometimes difficult to diſtinguiſh the diſcharge of a gonorrhœa from that of the fluor albus.

Cauſes, &c. Many ingenious arguments have of late been advanced to prove, that the gonorrhœa and the lues venerea are different affections, originating from two diſtinct ſpecies of virus; and this controverſy ſtill, perhaps, remains to be decided by future facts. Certain it is, that in 19 of 20 caſes of gonorrhœa, no ſymptom whatever of ſyphilis appears; and that the diſeaſe readily admits of cure without having recourſe to thoſe remedies which are univerſally requiſite for combating the contagion of ſyphilis. It is by no means wonderful, that in ſome caſes both contagions, ſuppoſing them different, ſhould be communicated at the ſame time. Nay, caſes are by no means rare, where the contagion of itch, though eſſentially different from both, has been communicated with either. But as undeniable proof that the contagion in both caſes is preciſely the ſame, it has been alleged by ſome, that the matter of a chancre introduced into the urethra will generate a gonorrhœa, and that the diſcharge from a gonorrhœa will produce chancre, bubo, and every other ſymptom of ſyphilis. On the other hand, however, it is contended, that when experiments of this nature are conducted with the greateſt accuracy, the matter of ſyphilis uniformly produces ſyphilis, and that of gonorrhœa, gonorrhœa only. Without pretending to decide on which of theſe experiments the greateſt dependence is to be put, we may only obſerve, that while an almoſt inconceivably ſmall portion of ſyphilitic matter applied to the glans penis, from connection with an infected female, infallibly produces ſyphilis if it be not ſpeedily removed, the matter of gonorrhœa, in every inſtance of that diſeaſe, is applied to the whole ſurface of the glans penis for many days together without producing almoſt any bad effect whatever. From this, therefore, there is ground for inferring, either that it is not capable of being abſorbed, or that if abſorbed it is innocent.

But while there have been diſputes with regard to the peculiar nature of the matter in gonorrhœa, there have alſo been controverſies with reſpect to the ſource from whence it is derived. While ſome ſuppoſe it to be principally purulent matter ariſing from ulcerations, others aſſert that no ſuch ulceration is ever produced in the urethra by gonorrhœa. They contend that the increaſed ſecretion in theſe caſes is exactly ſimilar to what happens in the catarrh. But the compariſon will by no means hold good in every particular: in the latter the whole membrane of the noſe is equally irritated; whereas in the gonorrhœa, only particular parts of the urethra ſeem to be affected. The diſeaſe, in the generality of caſes, ſeldom extends more than an inch and a half along that canal, and in many is confined (at leaſt in the beginning) to a ſmall ſpot about an inch from the extremity of the glans. The diſcharge is produced from that part of the urethra where the pain is felt; and the patient, when he voids his urine, feels no ſmarting till it reaches the inflamed ſpot: but as the diſorder increaſes, the inflammation affects a greater number of points, juſt in the ſame manner as chancres affect different parts of the glans. It might be ſuppoſed that diſſection would at once clear up this matter, and put an end to the diſpute; but this is far from being the caſe. Dr Simmons has ſeen ſeveral urethras opened in perſons who had a gonorrhœa at the time of their death: in three of them the ſurface of the urethra, as in the caſes related by Morgagni, appeared for ſome way down of a ſlight red colour, and in all of them was covered with mucus; but without any appearance of ulceration, except in two diſſections at Paris, in which moſt of the gentlemen preſent were convinced that they ſaw evident marks of it: but Dr Simmons ſays that the appearances were to him not ſufficiently ſatisfactory to enable him to decide with certainty on the ſubject. On the other hand, when we conſider that the diſcharge in a gonorrhœa is ſometimes tinged with blood, and that when this happens a little blood-veſſel is no doubt ruptured, we can have no reaſon to doubt that an ulceration may, and ſometimes does, happen in theſe caſes; eſpecially as we often obſerve an excoriation near the orifice of the urethra. It is certain, that wherever there is conſiderable inflammation, there will be danger of ulceration. Beſides, from a neglected or badly-treated gonorrhœa, we often ſee fiſtulas *in perineo*, and other ulcers of the urethra, penetrating through its ſubſtance, and affording a paſſage to the urine. And there can be no doubt that ſlight ulcerations of this canal often occur, and are afterwards perfectly obliterated, in a ſimilar manner to what happens in the papillæ of the tongue, the tonſils, &c. Such an obliteration will the more readily take place in a part like the urethra, defended with mucus, and not expoſed to the air, which is known to have no little effect in hardening a cicatrix.

But whether ulcers take place or not, whether the virus of gonorrhœa be preciſely of the ſame kind with that which gives ſyphilis, or of a different kind, there is reaſon from the phenomena of the diſeaſe to conclude, that the matter firſt acts by mixing with the mucus at the extremity of the urethra; and that from thence it is propagated upwards, particularly where the excretories of mucus are moſt numerous; and that on the parts to which it is applied, it operates as a peculiar irritating cauſe. The conſequences of this irritation will be inflammation and an increaſed ſecretion of mucus; and ſo far the complaint will be local. In ninety-nine caſes of an hundred a local affection of this kind conſtitutes the whole of the diſeaſe; and of this inflammation, ulcerations within the urethra, ſtrictures, and other local affections, may be the conſequence. But whether a diſeaſe of the habit ever takes place, unleſs when the contagion of ſyphilis is communicated with that of gonorrhœa, ſtill remains to be determined by future obſervations and experiments.

Nothing can be more variable than the period at which the diſeaſe makes its appearance after infection. Perhaps, at a medum, we may place it between the 4th and 14th day: but in ſome caſes it happens within 24 hours; and in others, not before the end of five or even ſix weeks: neither of theſe extremes, however, are common.

From what has been ſaid of the manner in which the contagious matter in gonorrhœa acts, and of the influence it exerts on thoſe parts with which it comes in contact, it follows, that the prevention of gonorrhœa muſt depend on the removal of the contagious matter as ſoon as that can be done; and where this is either altogether neglected or not properly accompliſhed, that the cure muſt depend on counteracting the inflammation which this contagious matter excities, and the conſequences which reſult from it.

The firſt of theſe intentions may be moſt certainly and moſt eaſily accompliſhed by careful lotion of all the parts to which the contagious matter has any chance of being applied. Theſe parts, at leaſt on the firſt application of the matter, are readily acceſſible: for even in men there is no reaſon to believe that it at firſt penetrates to any extent in the urethra. This waſhing of the parts ſhould be performed as ſoon as poſſible; becauſe then the matter is both moſt acceſſible and leaſt involved with mucus; but although waſhing cannot be accompliſhed at an early period, it ſhould not be neglected afterwards; for from the diſeaſe uniformly commencing, even when it does not appear till a conſiderable time after the application of the contagious matter, with a peculiar ſenſe of titillation at the external parts, particularly in men at the extremity of the urethra, there is reaſon to believe that the contagious matter attached to the mucus may remain latent there for a very conſiderable time. For the purpoſe of waſhing, with a view to the prevention of this diſeaſe, recourſe may be had to almoſt any watery fluid, provided it be not ſo ſtimulant as to produce bad effects from injuring the parts. Pure water, properly applied, is perhaps one of the beſt lotions; but there can be no doubt that its power in removing the contagious matter may be ſomewhat increaſed by ſuch additions as render it a more powerful ſolvent of mucus. With this intention, one of the moſt powerful additions is the vegetable alkali, either in its mild or cauſtic ſtate. In the latter ſtate it is the moſt active, but in the former it is moſt ſafe; and the *lixiva purificata* of the Edinburgh pharmacopœia, to the extent of half a drachm, diſſolved in ſix or eight ounces of water, is one of the beſt lotions that can be employed. The purpoſe of removing the contagion may often alſo be effectually anſwered from waſhing with water impregnated with ſoap; for there the alkali, though in a cauſtic ſtate, is prevented from exerting any diſagreeable effects, in conſequence of its being combined with oily matters.

With the view of preventing gonorrhœa, ſome have adviſed, that the alkali either in its mild or cauſtic ſtate, properly diluted with water, ſhould be injected into the urethra: and there can be no doubt, that by this means the contagious matter, when it has entered the urethra, may be removed. A removal may alſo be effected by the injection of a weak ſolution of corroſive ſublimate, which ſeems to act not by diſſolving the mucus but by producing an augmented ſecretion. But at a very early period of the diſeaſe, injections are probably unneceſſary; and if it has made any conſiderable progreſs, they are dangerous: for from the augmented ſenſibility of the part, even very gentle ones are apt to excite a high degree of inflammation.

There are practitioners who, ſuppoſing that the body poſſeſſes powers to expel the virus, and that the diſeaſe has a certain period to run through its ſeveral ſtages of progreſs, acme, and decline, are for leaving the cure to nature; or at leaſt content themſelves with aſſiſting her by an antiphlogiſtic regimen, gentle evacuations, and the like.

That in many caſes the diſorder admits of a natural cure, there can be no doubt; the increaſed ſecretion of mucus carrying off the virus faſter than it is formed, till at length the infection is wholly removed: But it is equally certain, that it every caſe, by the application of ſuitable remedies to the inflamed part, we may ſhorten the duration of the complaint, and abridge the ſufferings of the patient, with the ſame certainty and ſafety as we are enabled to remove the effects of an ophthalmia or any other local inflammation, by proper topical applications. General remedies, ſuch as occaſional blood-letting, a cooling diet, the liberal uſe of diluting liquors, and mild purges, are by all allowed to be uſeful, and even neceſſary. Aſtruc was of opinion that in theſe caſes blood letting ought to be repeated five or ſix times; and there are ſtill many practitioners who depend much on repeated evacuations of this ſort for a removal of the inflammation. But there is, perhaps, not one caſe in ten in which it is at all requiſite; and this ſmall number of caſes will conſiſt only of the ſtrong and plethoric in ſuch, when the chordee is frequent and painful, and the pulſe hard and full, the loſs of from eight to twelve ounces of blood will be beneficial, but it will be ſeldom neceſſary to repeat the operation the inflammation in theſe caſes is kept up by the local ſtimulus of the virus and the urine; and all that we can expect from veneſection is to moderate the pain and the frequency of erection. In perſons of a delicate habit, and of an irritable fibre, the evacuation will do no good; but if repeated will certainly be liable to do harm, by increaſing irritability, and of courſe rendering the patient more ſuſceptible of ſtimulus.

The utility, and even the neceſſity, of a cooling regimen, are ſufficiently obvious; wine and ſpirituous liquors, ſpiceries, a fiſh-diet, much animal-food, and ſalted and high ſeaſoned diſhes of every ſort, will conſtantly add to the complaint. The patient ſhould eat meat only once a-day, and that ſparingly. He ſhould abſtain from hot-ſuppers. Milk, mild vegetables, and fruit, ſhould conſtitute the principal part of his diet while the inflammatory ſymptoms continue. Every thing that tends to excite the venereal imagination ſhould be ſtudiouſly avoided; for whatever promotes erections of the penis will increaſe the inflammation, and of courſe add fuel to the diſeaſe. For the ſame reaſons much walking or riding on horſeback will be hurtful, from the irritation kept up in the perinæum by ſuch means. Violent exercife of any kind, or any thing that is liable to increaſe the heat and the momentum of the blood, will of courſe be improper.

The drinking freely of mild, cooling, mucilaginous liquors, ſuch as linſeed-tea, orgeat, whey, milk and water, almond emulſion, and the like, will be extremely, uſeful, by diluting the urine, and preventing its ſalts from ſtimulating the urethra. When the heat and pain in making water are very conſiderable, mucilaginous ſubſtances are found to have the beſt effect, particularly the gum tragacanth. It is a common practice to give equal doſes of this gum or gum arabic and nitre, and to diſſolve nitre in the patient's drink, with a view to leſſen the inflammation. But in theſe caſes nitre is always improper: it is known to be a powerful diuretic, its chief action being upon the urinary paſſages; ſo that the ſtimulus it occaſions will only ſerve to increaſe the evil it is intended to alleviate. Cream of tartar, on account of its diuretic quality, will be equally improper. Our view here is not to promote a preternatural flow of urine; for the virus, being inſoluble in water, cannot eaſily be waſhed away by ſuch means; but our object ought to be, to render the urine that is ſecreted as mild and as little ſtimulating as poſſible.

Mild purges, which conſtitute another material part of the general remedies, are no doubt extremely uſeful when exhibited with prudence; but it is well known that the abuſe of purgative medicines in this diſeaſe has been productive of numerous evils. Formerly it was a pretty general practice to give a large doſe of calomel at bed-time, three or four times a-week; and to work it off the next morning with a ſtrong doſe of the *pilulæ cocciæ*, or ſome other draſtic purge. This method was perſevered in for ſeveral weeks: in conſequence of which the patient often found himſelf troubled with an obſtinate gleet, and perhaps his conſtitution materially injured; the effect of ſuch a method being (eſpecially in irritable habits) to weaken the ſtomach and bowels, and lay the foundation of hypochondriacal complaints. Violent purging likewiſe often occaſions ſtrangury, hernia humoralis, and other troubleſome ſymptoms.

The purges employed in theſe caſes ſhould be gentle; ſuch as Rochelle ſalt, manna, tartariſed alkali, and the like. They ſhould be given only in a doſe ſufficient to procure two or three ſtools, and be repeated only every two or three days. The daily uſe of the purgative electuaries that are ſtill given by ſome practitioners, ſerves only to keep up a continual irritation on the bladder, and of courſe to prolong the inflammation.

The topical remedies that are uſed conſiſt chiefly of different ſorts of injections, the ingredients of which are extremely various; but their modes of operation may in general be referred to their mucilaginous and ſedative, or to their detergent, ſtimulating, and aſtringent qualities. In the hands of ſkilful practitioners, great advantages may doubtleſs be derrived from the uſe of theſe remedies; but, on the other hand, the improper and unſeaſonable adminiſtration of them may prove a ſource of irreparable miſchief to the patient.

We know that mucilaginous and oily injections will tend to allay the local inflammation; and that a ſedative

tive injection, ſuch as a ſolution of opium, will leſſen the irritability of the parts, and of courſe produce a ſimilar effect; the utility of ſuch applications is therefore ſufficiently obvious.

A detergent injection, or one that will act upon the mucus of the urethra, increaſe the diſcharge of it, waſh it away, and with it the venereal virus that is blended with it, can only be uſed as a prophylactic before the ſymptoms of infection have made their appearance. But great circumſpection is neceſſary in the uſe of this kind of injection. It it be too weak, it can be of no efficacy; and if it be too ſtrong, it may prove dangerous to the patient. A ſuppreſſion of urine has been brought on by the improper uſe of an injection of this kind. When the ſymptoms of inflammation have once made their appearance, the ſtimulus of ſuch an injection muſt be extremely hazardous. Excoriation of the urethra has but too often been produced by remedies of this ſort in the hands of adventurous and unſkilful practitioners.

While the inflammation of the urethra continues, every thing that ſtimulates it muſt be hurtful. If the injection excites a painful ſenſation in the urethra, as is but too often the caſe, it will be liable to produce ſwelled teſticles, difficulty in making water, excoriation, and other effects of increaſed inflammation: if, by its aſtringency, the running be checked before the virus that excited the diſcharge be properly ſubdued, the patient will be expoſed to freſh dangers; and perhaps to a variety of local complaints, ſuch as obſtructions in the urethra, and abſceſſes *in perinæo*, which are well known to be ſometimes owing to applications of this ſort improperly managed.

When the inflammation has ſubſided, gently ſtimulating and aſtringent injections may be uſed with ſafety, and with conſiderable advantage: for as the inflammation is at firſt excited by the ſtimulus of the venereal virus, ſo when the former begins to leſſen, we may be aſſured that the activity of the latter has abated in proportion; and, in general, when the inflammatory ſymptoms are entirely removed, it will be found that the mucus is no longer of an infectious nature but is merely the effect of an increaſed ſecretion and of relaxation. Mild-aſtringents will therefore ſerve to brace and ſtrengthen the veſſels ſecreting mucus, and in this way will leſſen the diſcharge, and greatly promote the cure. It is certain, that in the greater number of caſes, a gonorrhœa, which if treated by internal remedies alone, would continue for five or ſix weeks, or longer, may, when judiciouſly treated with injections, be cured in a fortnight, and very often in leſs time. The great aim, therefore, of the practitioner ought to be at firſt to make uſe of ſuch injections only as will tend to lubricate the ſurface of the urethra, and to counteract and deſtroy the ſtimulus of the virus: as the inflammation abates, he may add ſome gently aſtringent preparation to a mucilaginous and ſedative injection; taking care that its aſtringency be ſuited to the ſtate of the diſeaſe, and to the irritability of the patient. Amongſt a great variety of ſubſtances, mercury in different forms is one of thoſe that is the moſt frequently employed in injections. All theſe mercurial injections have more or leſs of aſtringency; and according to Dr Simmons, it is ſolely to this property that we are to aſcribe their effects; for the idea of their correcting the venereal virus was originally introduced, and has, he thinks, been continued upon miſtaken principles.

Calomel, mixed with the mucus diſcharged in a gonorrhœa, has no more power in deſtroying the infectious properties of that mucus than ceruſſe or any other preparation would have. A diluted ſolution of ſublimate injected into the urethra, will like a ſolution of verdigriſe, or blue vitriol, or any other ſtyptic, conſtringe the mouths of the lacunæ; but this is all that it will do, for it will never leſſen the infectious nature of the virus. The ſame thing may be obſerved of crude mercury extinguiſhed by means of mucilage, or of mercurial unction, blended with the yolk of an egg, and which, when thrown up into the urethra, will act nearly in the ſame manner as balſam of copaiva, or any other ſtimulating injection. The ſtimulus of calomel, however, has often been found of conſiderable efficacy; and in women, when the vagina only was affected, after waſhing the parts well, the cure has been accompliſhed by rubbing them repeatedly with mercurial ointment.

As the gonorrhœa is only a local affection, it may be inferred, that the internal uſe of mercury is unneceſſary towards the cure. Very often indeed this complaint may be removed without having recourſe to mercurials. Sometimes patients have been met with whoſe general health has been greatly impaired by a long continued uſe of mercury in ſuch caſes, while the original diſeaſe, the gonorrhœa, was rendered much worſe by it. In ſome it degenerated into a gleet, that was cured with extreme difficulty; in others it brought on a variety of diſtreſſing ſymptoms. In caſes of gonorrhœas, therefore, whenever mercury is adminiſtered, it ought to be, not with a view to expedite the cure, but merely to obviate the dangers of ſyphilis. When the infection is apparently ſlight, and the inflammation and the ſymptoms trifling, we may proceed without the aſſiſtance of mercury, eſpecially if the patient be of a weak relaxed, and irritable habit, likely to be injured by mercurial medicines. On the other hand, when the diſcharge is violent, the inflammation conſiderable, or the ſeat of the diſeaſe high up in the urethra, it is perhaps the moſt prudent plan to give mercurials in ſmall doſes, and in ſuch forms as ſeem the beſt adapted to the conſtitution of the patient.

The *pilulæ hydrargyri*, as prepared according to the receipts inſerted in the laſt edition either of the London or Edinburgh pharmacopœias, in both of which the mercury is rendered active merely by triture, may perhaps be conſidered as one of the mildeſt and moſt efficacious forms under which mercury can be exhibited by the mouth. Its efficacy will depend on its not irritating the bowels, and ſo paſſing off by ſtool; care muſt likewiſe be taken to prevent its affecting the mouth. Of the chemical preparations of mercury, the mildeſt and leaſt irritating is calomel. It may be given from gr. iſs. to gr. iii. at bed-time, occaſionally interpoſing a mild purgative to prevent it from ſalivating; but in general the mercurial pill juſt mentioned is to be preferred.

When there is no chancre or bubo, no appearance in ſhort of ſyphilitic infection, it would be improper to adminiſter corroſive ſublimate, the mercurius calcinatus, or any other of the more acrid preparations of mercury.

After a gonorrhœa proceeding from venereal cauſes has been removed, another kind of running without pain, called the *gonorrhœa mucoſa*, or *gleet*, ſometimes remains. Sometimes it ariſes from a conſtriction and excoriation of the urethra, and frequently it is the effect of an enlargement and diſeaſed ſtate of the proſtate. In each of theſe caſes, as the gleet is the effect of irritation, the cure will depend on the removal of the local diſeaſe that occaſions it. But there is another ſpecies of gleet that ſeems to depend chiefly on relaxation. It is in general free from infection, and is moſt common in thoſe who have had long and frequent gonorrhœas. It is likewiſe often the effect of a debilitated habit, from ſevere purging, or a long continued uſe of mercurials. A diſcharge of this kind is more frequent in women than in men; or, at leaſt, the fluor albus, after a gonorrhœa, will often be miſtaken for a gleet.

When there is no reaſon to ſuſpect remaining contagion, aſtringent injections will be of the greateſt ſervice. It will be neceſſary, at the ſame time, to attend to the health of the patient, by employing the Peruvian bark, chalybeate waters, cold bathing, and ſuch other remedies as will tend to ſtrengthen the ſyſtem: and indeed by the uſe of theſe, particularly by the Peruvian bark, ſuch runnings are often ſucceſsfully combated in thoſe who from apprehenſion of dangerous conſequences cannot be prevailed upon to employ injections. When there is no tendency to inflammation, the balſam of copaiva may be preſcribed with advantage in large doſes. Dr Simmons ſays he once ſaw a complaint of this ſort removed by applying a bliſter to the perinæum, after it had reſiſted a variety of other remedies. In the Medical Obſervations alſo we have an account of a gleet and incontinence of urine removed at once by a bliſter to the os ſacrum. In general, however, the other methods abovementioned will be ſufficient to remove it, though ſometimes it will continue for a long time in ſpite of all our endeavours to check it.—Other kinds of gonorrhœa, in which the ſemen itſelf is ejected, eſpecially during ſleep, may be cured by tonics and a mild cooling regimen.

392 Order V. EPISCHESES.

393 Genus CXXII. OBSTIPATIO.

Costiveness.

Obſtipatio, *Lin.* 166. *Vog.* 128. *Sag.* 221.

Coſtiveneſs is ſometimes occaſioned by debility in dyſpeptic perſons, ſometimes it is the effect of rigidity, and ſometimes it is ſymptomatic of the colic. It may proceed from an exceſſive heat of the liver; drinking rough red wines, or other aſtringent liquors; too much exerciſe, eſpecially on horſeback: it may likewiſe proceed from a long uſe of cold inſipid food, which does not ſufficiently ſtimulate the inteſtines. Sometimes it is owing to the bile not deſcending to the inteſtines, as in the jaundice; and at other times it proceeds from diſeaſes of the inteſtines themſelves, as a palſy, ſpaſms, tumors, a cold dry ſtate of the inteſtines, &c.

Exceſſive coſtiveneſs is apt to occaſion pains of the head, vomiting, colics, and other complaints of the bowels. It is peculiarly hurtful to hypochondriac and hyſteric perſons, as it generates wind and other diſtreſſing ſymptoms.

Perſons who are generally coſtive ſhould live upon a moiſtening and laxative diet; as roaſted or boiled apples, pears, ſtewed prunes, raiſins, gruels with currants, butter, honey, ſugar, and ſuch like. Broths with ſpinage, leeks, and other ſoft pot-herbs, are likewiſe proper. Rye-bread, or that which is made of a mixture of wheat and rye together, ought to be eat. No perſon troubled with coſtiveneſs ſhould eat white bread alone, eſpecially that which is made of fine flour. The beſt bread for keeping the belly ſoluble is what in ſome parts of England they call *meſlin*. It is made of a mixture of wheat and rye, and is very agreeable to thoſe who are accuſtomed to it.

Coſtiveneſs is increaſed by keeping the body too warm, and by every thing that promotes the perſpiration; as wearing flannel, lying too long a-bed, &c. Intenſe thought and a ſedentary life, are likewiſe hurtful. All the ſecretions and excretions are promoted by moderate exerciſe without doors, and by a gay, cheerful, ſprightly temper of mind.

The drink ſhould be of an opening quality. All ardent ſpirits, auſtere and aſtringent wines, as port, claret, &c. ought to be avoided. Malt liquor that is fine and of a moderate ſtrength is very proper. Butter-milk, whey, and other watery liquors, are likewiſe proper, and may be drank in turns, as the patient's inclination directs.

Thoſe who are troubled with coſtiveneſs ought, if poſſible, to remedy it by diet, as the conſtant uſe of medicines for that purpoſe is attended with many inconveniences, and often with bad conſequences. In time the cuſtom becomes neceſſary, and generally ends in a total relaxation of the bowels, indigeſtion, loſs of appetite, waſting of the ſtrength, and death.

The learned Dr Arbuthnot adviſes thoſe who are troubled with coſtiveneſs to uſe animal-oils, as freſh-butter, cream, marrow, fat broths, &c. He likewiſe recommends the expreſſed oils of mild vegetables, as olives, almonds, piſtaches, and the fruits themſelves; all oily and mild fruits, as figs; decoctions of mealy vegetables; theſe lubricate the inteſtines; ſome ſaponaceous ſubſtances which ſtimulate gently, as honey, hydromel, or boiled honey and water, unrefined ſugar, &c.

The doctor obſerves, that ſuch lenitive ſubſtances are proper for perſons of dry atrabilarian conſtitutions, who are ſubject to aſtriction of the belly and the piles, and will operate when ſtronger medicinal ſubſtances are ſometimes ineffectual; but that ſuch lenitive diet hurts thoſe whoſe bowels are weak and lax. He likewiſe obſerves, that all watery ſubſtances are lenitive; and that even common water, whey, ſour milk, and butter-milk, have that effect:—That new milk, eſpecially aſſes milk, ſtimulates ſtill more when it ſours on the ſtomach; and that whey, turned ſour, will purge ſtrongly:—That moſt part of fruits are likewiſe laxative; and that ſome of them, as grapes, will throw ſuch as take them immoderately, into a cholera morbus, or incurable diarrhœa.

When the body cannot be kept open without medicine, gentle doſes of rhubarb may be taken twice or thrice a-week. This is not near ſo injurious to the ſtomach as aloes, jalap, or the other draſtic purgatives ſo much in uſe. Infuſions of ſena and mana may likewiſe be taken, or half an ounce of tartariſed alkali diſſolved in water-gruel. About the ſize of a nutmeg of lenitive electuary taken twice or thrice a-day, generally anſwers the purpoſe very well.

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Genus CXXIII. ISCHURIA.

Suppression of *Urine.*

Iſchuria, *Sauv.* gen. 293. *Lin.* 167. *Vog.* 129. *Sag* 212. *Home*'s Clinical Experiments, ſect. xv.

This diſtemper is diſtinguiſhed into various ſpecies, according as the ſeat of it is in the kidneys, the ureters, the bladder, or the urethra; and hence theſe ſpecies are named *renalis*, *ureterica*, *veſicalis*, and *urethralis*.

395 1. *Iſchuria renalis*, or a ſuppreſſion of urine from an affection of the kidneys, happens but rarely; however, Dr Home in his Clinical experiments deſcribes ſuch a caſe. In the end of December 1774, a man of a full habit, aged 35, was ſeized with ſhivering, coldneſs, and ſevere cough. Three days after, his urine appeared high-coloured, was paſſed with pain, and in ſmall quantity. About the 8th of January 1775, he was attacked with violent pains in the ſmall of his back, over the whole abdomen, and in the ankles, with pain in the region of the liver when preſſed. A general ſwelling was afterwards obſerved all over the body, but moſtly in the ankles and abdomen, which laſt was tenſe and hard. Theſe were attended with vomiting, bad appetite, and conſiderable thirſt. When he entered the clinical ward (Janury 21ſt), the cough, ſickneſs, and vomiting, had gone off, but the ſuppreſſion of urine remained. The little which he made was paſſed with his ſtools, ſo that Dr Home ſaw it but once; and then it was pale, and had a white powder at bottom. The pains and ſwellings, which retained the impreſſion of the finger, continued; he had a head-ach, and a very ſlow pulſe, beating only 48 ſtrokes in a minute. He had taken a great many diuretic medicines before he came in. The day after his reception, he was ſeized with a ſpontaneous diarrhœa, which continued during the remainder of his life. Cryſtals of tartar were exhibited in doſes of half an ounce each morning; at bed-time he took 20 drops of tincture of opium with a ſcruple of nitre, and continued this courſe for eight days without any increaſe of urine. The ſtronger and heating diuretics were then tried, as an infuſion of juniper berries and pills of garlic; but they were attended with no ſenſible advantage. Whenever the pulſe became ſo ſtrong that he could bear bleeding, eight ounces of blood were taken away, which was ſizy. This was thrice repeated; he appeared eaſier after each bleeding, his pulſe bore it well, and the ſwellings and other ſymptoms abated. The heating diuretics, in this ſtate, were given up; and a mixture of vinegar and nitre was ſubſtituted in their place, in each doſe of which, taken every two hours, there was a ſcruple of nitre. Fomentations were applied to the region of the kidneys, and camphorated oil was afterwards rubbed on the part. He was ordered the ſemicupium, which from a deficiency of water in the hoſpital at that time he got only once; and which then ſeemed to have a good effect, as he paſſed a gill of urine when he was in it. Notwithſtanding this, however, the diſeaſe continually gained ground; he became comatoſe, delirious, and died ten days after his admiſſion.---On diſſection, the kidneys were found of an irregular form; ſome watery veſicles appeared on their ſurface, containing black gritty particles like fine ſand; and the lower part of the right kidney was conſiderably inflamed. The pylorus, part of the duodenum, and a conſiderable part of the ſmall inteſtines, were much inflamed. In the abdomen were found about five pounds of fluid, and in the cavities of the thorax about half a pound.

The lungs were a little inflamed, and full of ſmall tubercles on their ſurface and in their ſubſtance; the heart was large, and a polypus in each ventricle. About ſix ounces of fluid were found in the pericardium; in the brain nothing preternatural appeared, except about an ounce of water in each ventricle.

Dr Home ſeems to have been at a loſs for the remote cauſe of this ſuppreſſion of urine, which manifeſtly had its immediate origin from the kidneys having loſt the power of performing their functions. He thinks the inflammation which appeared in the right kidney was ſcarce ſufficient to have occaſioned the diſtemper, as the other would have ſupplied its place: for which reaſon alſo he thinks that the iſchuria was owing to a general affection of the ſyſtem; and that it was of an arthritic nature, the patient having been troubled with complaints of that kind for a long time before

2. The *iſchuria ureterica* is alſo a rare-diſeaſe, unleſs the obſtruction proceeds from a ſtone or clot of blood ſtopping up the paſſage. Gravel or ſtones, indeed, are very frequently formed in the kidneys; and, by falling into the ureters, occaſion an iſchuria, with violent pain, and ſymptoms more or leſs urgent in proportion to the ſize and ſhape of the ſtones. Sometimes it is attended with coldneſs of the extremities, nauſea, vomiting, and ſpaſtic conſtriction of the præcordia, a difficulty of making water, conſtipation of the belly, difficulty of breathing, ſtupor of the thigh, retraction of the teſticle to the *os pubis*, inquietude, loſs of ſtrength, ſyncope, and convulſive fits. When the violent pain has continued for ſeveral days and nights without intermiſſion, and has brought the patient exceeding low, and the ſuppreſſion of urine is complete, with coldneſs of the extremities and convulſions of the tendons, death is at hand. Nor is it a good ſign when the ſtone continues long in the ureter; for then the appetite decays, a nauſea and retching to vomit ſupervene, and the patient is conſumed with a hectic heat. Sometimes the pain is attended with an inflammation of the ſtomach and inteſtines; and ſometimes the diſeaſe ends in a dropſy of the breaſt, or lethargy, which ſoon carry off the patient. 396

The indications of cure are, to exclude the ſtone as eaſily as poſſible, and prevent the breeding of others. If the patient be of a ſanguineous temperament, Sydenham recommends to take away ten ounces of blood from the affected ſide; and then to give the patient a gallon of poſſet-drink in which two ounces of marſh-mallow roots have been boiled, injecting at the ſame time an emollient glyſter. After the poſſet-drink has been vomited up, and the clyſter returned, give a pretty large doſe of an opiate. But if the patient be old or weak, or ſubject to nervous affections, bleeding may be omitted, eſpecially if his urine at the beginning of the fit be coffee-coloured, and mixed with gravel; but as to other things, the cure is the ſame.—Huxham greatly recommends an emollient bath prepared of a decoction of marſh-mallow root, linſeed, fœnugreek ſeed, and flowers of chamomile, to which may be added a few white-poppy ſeeds. By the uſe of this bath he ſays he has ſeen the moſt cruel fit of the gravel ſuddenly ended, when neither copious bleeding nor opiates had the leaſt effect. Mild diuretics are alſo of ſervice. Hoffman recommends dulcified ſpirit of nitre as proper to relax the ſpaſtic ſtricture. It is to be taken with ſuitable diſtilled waters and ſyrup of poppies; or in broth, with a few ſpoonfuls of oil of ſweet almonds. Turpentine glyſters are alſo accounted very ſerviceable; and may be prepared of ten ounces decoction of chamomile, with half an ounce of turpentine diſſolved in the yolk of an egg, and about as much honey. The *ſal diureticus*, or acetated alkali, is much eſteemed by ſome, when taken along with an opiate. But when the ſtone is too big to paſs, Arbuthnot recommends a cool and diluent diet to hinder the further growth of it. Whey, infuſion of linſeed, decoction of marſhmallows, and gently reſolving diuretics, are alſo proper. To put a ſtop to the vomiting, *balſamum traumaticum* may be uſed with ſucceſs when almoſt every other means have failed.

397 3. The *iſchuria veſicalis* may ariſe from a ſtone in the bladder; and this indeed is the moſt common cauſe of it; but there are certain caſes in which, though the uſual quantity of urine, or perhaps more, be paſſed, the patient dies from the retention of a ſtill greater quantity in the bladder. Of this Dr Home gives the following inſtances. A man of 58 years of age, of a ſtrong ſpare habit, and never ſubject to the gravel, had, during the winter of 1777, a cough with expectoration, which went off in the beginning of 1778. About the 17th of February 1778 he felt ſome difficulty in paſſing his urine, and much pain about the region of the bladder. He continued in this way for ten days, after which he became eaſier on application of ſome medicines. The abdomen then ſwelled, and he had pains in his loins and thighs. On the 3d of March he was admitted into the clinical ward: his abdomen was then ſwelled and tenſe; and an evident fluctuation was felt, which ſome that touched him thought was ſonorous and produced by wind. A tumor was diſcovered betwixt the navel and ſpine of the os ilium on the left ſide, which gave him much pain, eſpecially when preſſed. This tumor became more eaſily felt after the ſwelling of the abdomen decreaſed, ſeemed round, and very near as large as the head of a child. It appeared very much on the left ſide, even when the patient lay on the right, and the tumor then became dependent. He paſſed urine frequently, and rather more than in health, as it was computed at four pints a-day. It was always clear, and of a light colour. His body had a ſtrong diſagreeable ſmell; his ſkin was dry, belly bound, and his appetite entirely gone, ſo that he had hardly taken any food for 12 days. His legs ſwelled ſlightly for ſome days in the evening. His pulſe was generally regular, ſometimes ſlower than natural, and ſometimes a little quicker; being once felt at 64, and another time at 92. He was often ſeized, eſpecially after eating or drinking, with hiccough; which increaſed and laſted till his death. On the 20th day of his diſeaſe, after ſome doſes of ſquills, the general ſwelling of his abdomen fell, became much ſofter, and more diſtinctly diſcovered the ſwelling of the left ſide. The next day a vomiting came on; he became delirious, and died the day following. The body being opened, it appeared that the tumor which was ſo diſtinctly felt on the left ſide of the abdomen, was owing to a diſtenſion of the bladder with urine. Its fundus reached to about the diviſion of the aorta into the iliacs; it entirely filled the pelvis, and contained between five and ſix pounds of urine of a pale colour. On examining the external ſurface, its neck, and the beginning of the urethra, were found to be ſurrounded with a ſcirrhoſity, which impeded the evacuation of the urine. The bladder itſelf was much thickened, but not more in one part than another. The ureters entered naturally; but were much thickened in their upper half near the kidney. The kidneys were ſomewhat enlarged; particularly the left, which had ſeveral watery veſicles on its external ſurface. Theſe organs were not in their uſual ſituation; but lay cloſe on each ſide of the ſpine, and very near the aorta; ſo that the renal veſſels were very ſhort. What was very ſingular, the lower end of each roſe over the ſpine, and they were united together by their membranes and ſubſtances, the aorta paſſing beneath the union. The bladder had preſſed conſiderably on this part; and the peritoneum covering them was coſiderably thicker than natural. The lungs adhered every where to the pleura, and in ſome places very firmly; they were of a looſe texture and black colour; and the veins of the lower extremities were turgid with blood. It does not appear that this patient got any medicines further than a few dried ſquills, which diminiſhed the ſwellings and brought off much wind. He alſo got a mixture of muſk, and afterwards of opium, for his hiccough; but without ſucceſs. His diſeaſe was miſtaken for an aſcites; and the catheter was not tried: but in another caſe the uſe of this inſtrument was apparently of more ſervice than any internal medicines. This laſt patient was about 90 years of age, and laboured under ſymptoms very ſimilar to thoſe already mentioned. When admitted into the clinical ward, he had the hypogaſtric region ſwelled, and difficulty of paſſing his water; but without pain, vomiting, or hiccough. He had loſt all appetite; was thirſty, and coſtive. His pulſe was 110, and weak. In the evening about three Engliſh pints of pale clear urine were drawn off by means of the catheter: the next day all the ſymptoms were gone off or abated. After this he continued to paſs ſome urine, ſometimes voluntarily, ſometimes involuntarily and inſenſibly; but ſo much always remained behind, that his bladder was conſtantly full, unleſs when the urine was drawn

off, which was done twice every day. The urine was ſometimes pale, ſometimes of a deep red colour; and once there was ſome blood mixed with it, which perhaps might have been occaſioned by the catheter. About the ſixth day the urine was very putrid, with much purulent-like matter at the bottom, and was paſſed with more pain. About the 11th, the putrid ſmell went off. The next day all the urine paſſed inſenſibly except what was drawn off; and an hiccough, though not very ſevere, had come on. In this way he continued without fever, though frequently troubled with the hiccough, eſpecially during thoſe nights in which the urine had not been drawn off. A month after admittance, the bladder, with the aſſiſtance of the catheter, was almoſt entirely, though inſenſibly evacuated, and the hiccough had left him; he had no other complaint but that of voiding his urine inſenſibly, the natural effect of a ſcirrhous bladder, and which was probably incurable. With this patient the hot bath and mercurials were tried, in order to ſoften the ſcirrhoſity of the bladder, but without effect.

398 4. The *iſchuria urethralis* ariſes from ſome tumour ſtopping up the paſſage of the urethra, and thus hindering the flow of urine. It is an uncommon diſtemper, and generally follows a gonorrhœa. Dr Home gives us an example of this alſo.—The patient was a man of 60 years of age, who had laboured under a gonorrhœa ſix months before, and which was ſtopped by ſome medicines in two or three days. He felt, ſoon afterwards, a difficulty in paſſing his urine, which gradually increaſed. About 10 days before his admiſſion into the clinical ward, it was attended with pains in the glans, and *ardor urinæ;* he had paſſed only about eight ounces the day before his admiſſion, and that with very great difficulty; and the hypogaſtric region was ſwelled and pained. On introducing the catheter, three pounds of urine were drawn off, by which the pain and ſwelling were removed. The inſtrument required force to make it paſs the neck of the bladder, and blood followed the operation; and the finger, introduced into the anus, felt a hard tumor about its neck. He was treated with mercurial pills and ointment, by which the ſwelling about the neck of the bladder ſoon began to decreaſe; but at the ſame time a ſwelling of the right teſticle appeared. He was vomited with four grains of turbith-mineral, which operated gently; and here Dr Home obſerves, that though theſe vomits are little uſed, from a miſtaken notion of their ſeverity, he never ſaw them operate with more violence than other vomits, or than he could have wiſhed. The ſwelling diminiſhed in conſequence of the vomit and ſome external applications: and the cure was completed by bleeding and a decoction of mezereon-root.

GENUS CXXIV. DYSURIA. 399

DIFFICULTY of DISCHARGING URINE.

Dyſuria, *Sauv.* gen. 265. Lin. 57. *Vog.* 164. *Sag.* 213.
Stranguria *auctorum.*

A difficulty of making water may ariſe from many different cauſes; as ſome from acrid matter in the blood, cantharides, for inſtance: and hence a ſtrangury very often ſucceeds the application of bliſters. In many caſes it ariſes from a compreſſion of ſome of the neighbouring parts; of the uterus, for inſtance, in a ſtate of pregnancy. Or it may ariſe from a ſpaſmodic affection of the bladder, or rather its ſphincter; or from an inflammation of theſe parts, or others near them. Hence the diſeaſe is diſtinguiſhed into ſo many ſpecies, the cure of which depends upon the remedies indicated by their different cauſes.

But the moſt common, as well as the moſt dangerous ſpecies is that ariſing from a calculous concretion, or

STONE in the BLADDER. 400

Dyſuria calculoſa, *Sauv.* ſp. 12.

The ſigns of a ſtone in the bladder are, pain, eſpecially about the ſphincter; and bloody urine, in conſequence of riding or being jolted in a carriage; a ſenſe of weight in the *perinæum;* an itchneſs of the *glans penis;* ſlimy ſediment in the urine; and frequent ſtoppages in making water; a *teneſmus* alſo comes on while the urine is diſcharged: but the moſt certain ſign is, when the ſtone is felt by the finger introduced into the anus, or by the catheter.

Cauſes, &c. It is not eaſy to ſay what the particular cauſes are that occaſion the apparently earthy particles of the fluids to run together, and form thoſe calculous concretions which are found in different parts of the body, and eſpecially in the organs for ſtraining off and diſcharging the urine.

The gout and ſtone are generally ſuppoſed to have ſome affinity, becauſe gouty people are for the moſt part afflicted with the gravel. But perhaps this is in part owing to their long confinement, and to the lying on the back, which people who labour under the gout are often obliged to ſubmit to; ſince the want of exerciſe, and this poſture, will naturaly favour the ſtagnation of groſs matters in the kidneys: beſides, there are many inſtances of people ſeverely afflicted with the ſtone for the greateſt part of a long life, who have never had the leaſt attack of the gout.

There is, however, good reaſon for believing, that ſome farther connection takes place between the two diſeaſes; and when treating of the gout we have already given ſome account of the opinion of an ingenious anonymous author, who has endeavoured to prove, that both the one and the other depend on a peculiar acid, the concreting or lithic acid, which is always preſent in blood; and which may be precipitated from thence by various cauſes, ſuch as the introduction of other acids, or the like. When thus precipitated, he ſuppoſes it to produce the whole phenomena of both diſeaſes. The objections we formerly ſtated to his theory of gout, do not equally militate againſt that of calculus; and it is at leaſt certain, from the beſt chemical analyſis, that what are commonly called *urinary calculi*, and have been conſidered as entirely an earthy matter, conſiſt principally of acid in a ſolid ſtate united only with a ſmall proportion of earth or mucus. We may, therefore, whether this hypotheſis be altogether well founded or not, juſtly view lithiaſis as depending on the ſeparation of an acid from the blood.

Whatever may be the particular cauſe of the diſpoſition

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poſition to *lithiaſis*, the kidneys appear to be the moſt likely places for particles to concrete or run together, becauſe of the great quantity of blood which paſſes through the renal arteries, and which comes immediately from the heart, fraught with various newly-received matters, that have not undergone much of the action of the veſſels, and therefore cannot as yet be ſuppoſed to be thoroughly aſſimilated.

Anatomiſts who have carefully examined the kidneys in the human ſubject, particularly M. Bertin, inform us, that there are two ſets of *tubuli uriniferi;* the one continued directly from the extremities of the renal artery, and the other ſpringing from that veſicular texture which is conſpicuous in the kidneys.

It is in this veſicular part of the kidney that we preſume the particles of the concreting matter firſt ſtagnate and coaleſce: for it is hardly to be ſuppoſed, that ſuch ſolid matters could be allowed to ſtop in the extremities of the renal arteries, ſince the blood, and the urine ſeparated from it, muſt flow through theſe veſſels with great degrees of force and velocity; but in the intermediate veſiculæ the particles may lie, and there attracting each other, ſoon come to acquire ſenſible degrees of magnitude, and thus become ſand or gravel. As long as this ſand or gravel formed in the veſicular part of the kidney lies quiet, there will be no pain or uneaſineſs, until the concretions become large enough to preſs either on the adjoining *tubuli*, or on the blood-veſſels; then a ſenſe of weight, and a kind of obtuſe pain in the loins, will be felt. But when the ſmall pieces of concreting matter ſhall be diſlodged and waſhed off by the force of the circulating fluids, or looſened by ſome ſpaſmodic action of the moving fibres in theſe parts, they will in their paſſage create pain, raiſe different degrees of inflammation, or perhaps lacerate ſome blood-veſſels, and cauſe bloody urine. When theſe little concretions happen to be detained in the pelvis of the kidney, or any other place where a flow of urine continually paſſes, they ſoon increaſe in ſize, and become calculi, from the conſtant acceſſion of particles, which are attracted by the original bit of ſand, which thus become the nucleus of a ſtone.

It is an opinion which Hippocrates firſt advanced, and which has been almoſt univerſally adopted by his followers, and has remained till lately uncontroverted, that the ſtone and gravel are generated by the uſe of hard water. And from this quality, which the waters of certain ſprings poſſeſs, of depoſitiug a large earthy ſediment, either in the aquæducts thro' which they are conveyed, or in the veſſels in which they are boiled or preſerved, it was conjectured, that in paſſing through the kidneys, and eſpecially whilſt retained in the bladder, they would let fall their groſſer particles, which by the continued appoſition of freſh matter, connected by the animal gluten, and compacted by the muſcular action of that organ, would in time form a calculus ſufficiently large to produce a train of the moſt excruciating ſymptoms. And this reaſoning *à priori* has been ſuppoſed to be confirmed by facts and experience; for not to mention the authority of Hippocrates, Dr Liſter has obſerved, that the inhabitants of Paris are peculiarly ſubject to the ſtone in the bladder. Nicholas de Blegny has related the hiſtory of one who was diſſected at Paris, in whom the pylorus, a great part of the duodenum, and the ſtomach itſelf, were found incruſtated with a ſtony matter, to the thickneſs of a finger's breadth. And it is well known, that the water of the river Seine, with which that city is ſupplied, is ſo impregnated with calcareous matter, as to incruſtate, and in a ſhort time to choak up, the pipes through which it runs. But on the other hand it is objected, that the human calculus is of animal origin, and by chemical analyſis appears to bear very little analogy to the ſtony concretions of water; and though it be allowed, that more perſons are cut for the ſtone in the hoſpitals at Paris than in moſt other places; yet upon inquiry it is found, that many of thoſe patients come from different provinces, and from towns and villages far diſtant from the Seine.

Dyſuria.

Dr Percival conjectures, that though this diſeaſe may chiefly depend upon a peculiar diſpoſition to concrete in the animal fluids, which in many inſtances is hereditary, and in no inſtance can with certainty be imputed to any particular cauſe; yet hard water is at leaſt negatively favourable to this diatheſis, by having no tendency to diminiſh it. The urine of the moſt healthy perſon is generally loaded with an apparently terreous matter, capable in favourable circumſtances of forming a calculus; as is evident from the thick cruſt which it depoſits on the ſides of the veſſels in which it is contained. And it ſeems as if nature intended by this excretion to diſcharge all the ſuperfluous ſalts of the blood, together with thoſe earthy particles, which are either derived from our aliment, and fine enough to paſs thro' the lacteals, though inſuperable by the powers of circulation, or which ariſe from the abraſion of the ſolids, or from the diſſolution of the red globular part of our fluids. Now water, whether uſed as nature preſents us with it, or mixed with wine, or taken under the form of beer or ale, is the great diluter, vehicle, and menſtruum, both of our food, and of the ſaline, earthy, and excrementitious parts of the animal juices. And it is more or leſs adapted to the performance of theſe offices, in proportion to its degree of purity. For it muſt appear evident to the moſt ordinary underſtanding, that a menſtruum already loaded, and perhaps ſaturated with different contents, cannot act ſo powerfully as one which is free from all ſenſible impregnation. Nor is this reaſoning founded upon theory alone; for it is obſerved, that Malvern water, which iſſues from a ſpring in Worceſterſhire remarkable for its uncommon purity, has the property of diſſolving the little ſabulous ſtones which are often voided in nephritic complaints. And the ſolution too, which is a proof of its being complete, is perfectly colourleſs. Hence this water is drunk with great advantage in diſorders of the urinary paſſages. And during the uſe of it the patient's urine is generally limpid, and ſeldom depoſits any ſandy ſediment. Yet notwithſtanding this appearance of tranſparency, it is certainly at ſuch times loaded with impurities, which are ſo diluted and diſſolved as not to be viſible. For it is attended with a ſtrong and fetid ſmell, exactly reſembling that of aſparagus. Hoffman mentions a pure, light, ſimple water in the principality of Henneberg, in Germany, which is remarkable for its efficacy in the ſtone and gravel; and a water of ſimilar virtues was diſcovered not many years

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ago in the black foreſt, near Oſterod, which upon examination did not afford a ſingle grain of mineral matter. Indeed it is worthy of obſervation, that moſt of the ſprings which were formerly held in great eſteem, and were called *holy wells*, are very pure, and yield little or no ſediment.

Dr Percival informs us that a gentleman of Mancheſter, who had been long ſubject to nephritic complaints, and often voided ſmall ſtones, was adviſed to refrain from his own pump-water, which is uncommonly hard, and to drink conſtantly the ſoft water of a neighbouring ſpring; and that this change alone, without the uſe of any medicine, has rendered the returns of his diſorder much leſs frequent and painful. A lady alſo, much affected with the gravel, was induced by the peruſal of the firſt edition of Dr Percival's Eſſay, to try the effect of ſoft water; and by the conſtant uſe of it remained two years entirely free from her diſorder.

In nephritic caſes, diſtilled water would be an excellent ſubſtitute for Malvern water, as the following experiment evinces.

Two fragments of the ſame calculus nearly of equal weight, were immerſed, the one in three ounces of diſtilled water, the other in three ounces of hard pump-water. The phials were hung up cloſe together in a kitchen-chimney, at a convenient diſtance from the fire. After 14 days maceration, the calculi were taken out, and carefully dried by a very gentle heat. The former, *viz.* that which had been immerſed in diſtilled water, was diminiſhed in its weight a grain and a half; the latter had loſt only half a grain.

It is the paſſage of theſe calculi from the kidneys down into the bladder, which occaſions the pain, vomiting, and other ſymptoms, that conſtitute what is uſually termed a *fit of the gravel* or *ſtone*.

When an inflammation is actually raiſed, the diſeaſe is known by the name of *nephritis*, and has been already treated of.

As ſoon as the ſtone paſſes through the ureter, and falls into the bladder, the pain and other nephritic ſymptoms ceaſe; and every thing will remain quiet, either till the ſtone be carried into the urethra, or until it has remained long enough in the bladder to acquire weight ſufficient to create new diſtreſs.

If a ſtone happens to be ſmooth and of a roundiſh form, it may lie in the bladder and acquire conſiderable bulk before it can be perceived by the patient; but when it is angular, or has a rugged ſurface, even though it may be ſmall in ſize, yet it ſeldom fails to raiſe pain, and occaſion bloody urine, or the diſcharge of a ſlimy fluid, with teneſmus, and difficulty in making water.

There have been various attempts made to diſſolve the ſtone; and there are certainly ſome articles which have this effect when applied to them out of the body; but the almoſt total impoſſibility of getting theſe conveyed to the kidneys, renders it extremely doubtful whether a ſolvent ever will be diſcovered. Of all the articles employed for this purpoſe, no one perhaps has had greater reputation than fixed alkaline ſalt in its cauſtic ſtate, particularly under the form of the *aqua lixivi cauſtica*: but this being of a very acrid nature, it requires to be well ſheathed by means of ſome gelatinous or mucilaginous vehicle. Veal-broth is as convenient as any for this purpoſe; and accordingly it is uſed by thoſe who make a ſecret of the cauſtic alkali as a ſolvent of calculus;

Dyſuria.

Mr Blackrie, who has taken much pains in this inquiry, has proved very ſatisfactorily, that Chittrick's noſtrum is no other than ſoap-lees given in veal-broth, which the patients ſend every day to the doctor, who returns it mixed up with the medicine, in a cloſe veſſel ſecured by a lock.

It is not every caſe, however, that either requires or will bear a courſe of the cauſtic alkali. Some calculi are of that ſoft and friable nature, that they will diſſolve even in common water; and there are caſes wherein it appears that the conſtant uſe of ſome very ſimple decoction or infuſion of an inſignificant vegetable, has brought away large quantities of earthy matter, in flakes which apparently have been united together in layers to form a ſtone. Dr Macbride aſſures us, that a decoction of raw coffee, only 30 berries in a quart of water, boiled till it acquired a deep greeniſh colour, taken morning and evening to the quantity ef eight or ten ounces, with ten drops of ſweet ſpirit of nitre, had the powerful effect of bringing away, in the courſe of about two months, as much earthy matter in flakes as filled a large tea-cup. The patient was far advanced in years; and, before he began this decoction, had been reduced to great extremities by the continuance of pain and other diſtreſſing ſymptoms: he was purged occaſionally with *oleum ricini.*

Very lately the alkali in a mild ſtate, and in a different form, has been much uſed by many calculous patients and with great advantage, under the form of what is called *alkaline aërated water*. For the introduction of this medicine, or at leaſt for its extenſive uſe, we are chiefly indebted to that ingenious phyſician Dr William Falconer of Bath. He has lately publiſhed an account of the *Aqua Mephitica Alkalina*, or Solution of fixed alkaline ſalt, ſaturated with fixable air, in calculous diſorders; which contains a number of caſes ſtrongly ſupporting the benefit to be derived from it. But whether the good effects obtained in theſe inſtances are to be explained from its operating as a ſolvent of calculus, ſeems to be extremely doubtful. There are indeed caſes in Dr Falconer's treatiſe, of patients in whom, after uſing it for a conſiderable time, no ſtone could be detected by ſounding, although it had been diſcovered in that way before they began the employment of it. But in many inſtances, the relief has been ſo ſudden, that it may be concluded, that, notwithſtanding the eaſe obtained, the calculus ſtill remained. In ſuch caſes, it probably removed from the urine that quality by which it gives to the calculus freſh accretions, producing that roughneſs of its ſurface by which it is chiefly capable of acting as a ſtimulus. For the diſtreſſing ſymptoms reſulting from ſtone, are more immediately to be attributed to the inflammatory and ſpaſmodic affections which it induces; and when its ſurface is leaſt capable of operating as a ſtimulus, theſe of courſe will be leaſt conſiderable. It is therefore not improbable, that this remedy produces relief, by preventing freſh additions being made to the calculus.

An infuſion of the ſeeds of *daucus ſylveſtris* ſweetened with honey, is another ſimple and much celebrated

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remedy; it has been found to give conſiderable eaſe in caſes where the ſtomach could not bear any thing of an acrid nature: the leaves of the *uva urſi* were ſtrongly recommended by the late very celebrated De Haen; and, whatever its way of operating may be, ſeems to have been productive of good effects in ſome inſtances. There is no reaſon to believe that it has any influence in diſſolving calculus; and indeed it ſeems to be chiefly uſeful in theſe inſtances where ulcerations take place in the urinary paſſages.

In the Edinburgh Medical Commentaries, vol. 3. we have an account of a method uſed by the inhabitants of Arabia Petræa for curing the ſtone, to which they are very much ſubject, and which the author (an Engliſh gentleman of experience and candour) affirms he has ſeen frequently performed with never-failing ſucceſs. By means of a catheter they inject into the bladder a weak ley of alkali with the purified fat of a ſheep's tail, and a proper quantity of opium all put together. Their catheters are made of gold; and in performing the operation they introduce them quite into the bladder; ſo that the compoſition is ſafely conveyed to the ſtone without hurting any other part. But when a ſtone is ſituated in the kidney, they have no method of cure.

If this method of curing by injection could be ſafely practiſed, it would no doubt greatly have the advantage over that of taking alkalies by the mouth, where the medicine is not only much weakened, but the conſtitution of the patient runs the riſk of being greatly injured. But from ſome experiments mentioned in the ſecond volume of the Medical Tranſactions, it appears that the human calculi are very different from one another in their natures. Some, for inſtance, will eaſily yield to an alkaline menſtruum, and very little to an acid; while others are found to reſiſt the alkali, and yield to the acid; and ſome are of ſuch a compact nature, that they yield neither to acids nor alkalies. An attention, however, to the fragments, ſcales, or films, which the ſtone may caſt off, and alſo to the contents and ſediment of the urine, may lead to the diſcovery of what ſolvent is proper, or whether the ſtone can be diſſolved by any. To uſe either alkalies or acids improperly may be hurtful; though there may be ſuch kinds of calculi as demand the alternate uſe of acids and alkalies; nay, there may be found calculi of oppoſite kinds in the ſame ſubject.

In ſuch caſes as will not allow us to think of diſſolving the ſtony concretions, and where the only ſcheme is to palliate and procure eaſe from time to time, little more can be done than to keep the bowels open occaſionally by ſome gentle cathartic, and waſh off as much of the looſe gravelly matter and ſlime as can be removed by ſuch mild diuretic infuſions and decoctions as ſhall be found to paſs freely and ſit well on the ſtomach. Perſons afflicted with the ſtone ſhould be careful in reſpect of their diet, and ſtudiouſly avoid all heavy and flatulent food, as well as high ſauces that are apt to turn rancid. For the ſame reaſon, butter and acids are to be ſhunned; for theſe often create heart-burning, and every thing that offends the ſtomach raiſes the nephritic pain; ſuch is the ſympathy that obtains between the digeſtive and the uropoietic organs.

Dyſuria.

There have been ſurgeons bold enough to entertain an idea of cutting even into the kidney, in order to extract a ſtone: this, however, except in caſes where an abſceſs has been formed, and nature points out the way is merely chimerical. But cutting into the bladder for the ſame purpoſe, is an ancient and well-known operation, and often crowned with ſucceſs. A deſcription, however, of this operation belongs to the article Surgery, to which we refer; and here ſhall only make this remark, that a ſurgeon ſhould never begin his operation, until he and his aſſiſtants are perfectly ſatisfied, from actually feeling the ſtone, that there is one in the bladder; becauſe it has ſometimes happened, that when the inciſion has been made, no ſtone could be found: and the patient having died in conſequence of the operation, and the body being opened, it has appeared that the ſymptoms which occaſioned the belief of a ſtone in the bladder aroſe from ſome other cauſe.

When a dyſuria proceeds from any acrimonious matter thrown into the blood, it may be readily cured by bleeding, emollient clyſters, cooling and diluting drinks with gum arabic or gum tragacanth, linſeed tea, or the warm bath. When it ariſes from inflammations of the bladder or parts adjoining to it, we are to regard it only as a ſymptomatic affection; and the remedies uſed to remove the primary diſeaſe will alſo remove the dyſuria. Sometimes it may ariſe from an ulcer of the bladder; in which caſe it is generally incurable; a mild nutritious diet will, however, protract the patient's life.

Genus CXXV. DYSPERMATISMUS. 401

Difficult Emission *of* Semen.

Dyſpermatiſmus, *Sauv.* gen. 260.
Sterilitas, *Lin.* 171. *Sag.* 211.
Ageneſia, *Vog.* 283.

This impediment proceeds generally from obſtructions in the urethra, either by tumors in itſelf, or in the cavernous bodies of the penis; in which caſe the treatment is the ſame as in the iſchuria urethralis; ſometimes it is owing to a kind of epileptic fit which ſeizes the man in the venereal act; and ſometimes the ſemen, when ejected from the proper receptacles, is again abſorbed by them, or flows into the bladder and is expelled along with the urine. The laſt caſe is very difficult, or indeed impoſſible to cure; as proceeding from ſcirrhi, or other indiſſoluble tumors of the verumontanum, or the neighbouring parts. In ſome it proceeds merely from too violent an erection: in which caſe emollient and relaxing medicines will be of ſervice; and we have an example of a cure performed by means of theſe in the firſt volume of the Edinburgh Medical Eſſays.

Genus CXXVI. AMENHORRHOEA. 402

Suppression *of the* Menses.

Amenorrhœa, *Vog.* 130.
Dyſmenorrhœa, *Lin.* 168. *Sag.* 218.

This, with ſome other ſymptoms, as dyſpepſia, yellowiſh or greeniſh colour of the ſkin, unuſual appetites, &c. conſtitutes the *chloroſis* already treated of, and which ſeldom or never appears without a ſuppreſſion of the menſes. In Dr Home's Clinical Experi-

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ments we find the virtues of ſeveral emmenagogues ſet forth in the following manner. Chalybeates ſeldom or never ſucceeded: they were always found more uſeful in diminiſhing the evacuation when too violent, than in reſtoring it when deficient. The tincture of black hellebore proved ſucceſsful only in one of nine or ten caſes, though given to the length of four tea-ſpoonfuls a-day, which is double the quantity recommended by Dr Mead. Compreſſion of the crural artery, recommended by Dr Hamilton in the Phyſical and Literary Eſſays, Vol II. proved ſucceſsful only in one of ſix caſes. From the effects produced by this compreſſion, it has the ſtrongeſt appearance of loading the uterus with blood; from the ſenſations of the patient it produces the ſame effects as the approach of the menſes, and has every appearance in its favour; yet does not ſucceed. Dr Home ſuppoſes that the uterus is more frequently in too plethoric and inflammatory a ſtate; in which caſe, this remedy will do more hurt than in a ſtate of inanition; however, he owns, that in the caſe in which it did ſucceed, the patient was plethoric and inflammatory. Veneſection is recommended as an excellent remedy; the Doctor gives three inſtances of its ſucceſs, and ſays he could give many more. It acts by removing the plethoric ſtate of the uterus, relaxing the fibres, and giving the veſſels full play; ſo that their action overcomes all reſiſtance, and the evacuation takes place. It is of no great moment from whence the blood is taken; the ſaphænic vein will perhaps empty the uterus moſt; but it is difficult to get the proper quantity from it, and the quantity of the diſcharge cannot be ſo well meaſured. The powder of ſavine is a moſt powerful remedy; and proved ſucceſsful in three caſes out of four in which it was tried. It was given to the quantity of half a drachm twice a-day. It is a ſtrong topical ſtimulus, and ſeems improper in plethoric habits. Madder-root, according to Dr Home, is a very powerful medicine in this diſeaſe; and proved ſucceſsful in 14 out of 19 caſes in which it was tried, being ſometimes exhibited in the quantity of two ſcruples, or a drachm, four times a-day. It has ſcarce any ſenſible effects; never quickens the pulſe, or excites inflammatory ſymptoms: on the contrary, the heat, thirſt, and other complaints abate; and ſometimes theſe ſymptoms are removed, though the diſeaſe be not cured; but when it ſucceeds, the menſes appear from the third to the 12th day.—For other methods of curing the amenorrhœa, ſee Chlorosis.

Amenorrhœa.

We have now conſidered all thoſe diſeaſes enumerated in Dr Cullen's Noſology, whoſe cure is to be attempted chiefly by internal medicines. The other genera either require particular manual operations, or a very conſiderable uſe of external applications; and therefore properly fall under the article Surgery. To this, therefore, we ſhall refer the genera which fall under the three laſt orders of this claſs of locales, viz, the *tumores*, *ectopiæ*, and *dialyſes*; and we ſhall add, by way of Appendix, a few obſervations on ſome important affections to which Dr Cullen has not given a place in his ſyſtem.

APPENDIX.

ANGINA PECTORIS.

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Dr Heberden was the firſt who deſcribed this diſeaſe, though it is extremely dangerous, and, by his account not very rare. It ſeizes thoſe who are ſubject to it when they are walking, and particularly when they walk ſoon after eating, with a moſt diſagreeable and painful ſenſation in the breaſt, which ſeems to threaten immediate deſtruction: but the moment they ſtand ſtill, all the uneaſineſs vaniſhes. In all other reſpects the patients at the beginning of this diſorder are well, and have no ſhortneſs of breath; from which the *angina pectoris* is totally different. After it has continued ſome months, the fits will not ceaſe inſtantaneouſly on ſtanding ſtill; and it will come on not only when the patients are walking, but when they are lying down, and oblige them to riſe up out of their beds every night for many months together. In one or two very inveterate caſes, it has been brought on by the motion of a horſe or carriage, and even by ſwallowing, coughing, going to ſtool, ſpeaking, or by any diſturbance of mind. The perſons affected were all men, almoſt all of whom were above 50 years of age, and moſt of them with a ſhort neck and inclining to be fat. Something like it however, was obſerved in one woman, who was paralytic; and one or two young men complained of it in a ſlight degree. Other practitioners have obſerved it in very young perſons.

When a fit of this ſort comes on by walking, its duration is very ſhort, as it goes off almoſt immediately upon ſtopping. If it comes on in the night, it will laſt an hour or two. Dr Heberden met with one in whom it once continued for ſeveral days; during all which time the patient ſeemed to be in imminent danger of death. Moſt of thoſe attacked with the diſtemper died ſuddenly: though this rule was not without exceptions; and Dr Heberden obſerved one who ſunk under a lingering illneſs of a different nature.

The *os ſterni* is uſually pointed to as the ſeat of this malady; but it ſeems as if it was under the lower part of that bone, and at other times under the middle or upper part, but always inclining more to the left ſide; and in many caſes there is joined with it a pain about the middle of the left arm, which appears to be ſeated in the biceps muſcle.

The appearance of Dr Heberden's paper in the Medical Tranſactions very ſoon raiſed the attention of the faculty, and produced other obſervations from phyſicians of eminence; namely, Dr Fothergill, Dr Wall of Worceſter. Dr Haygarth of Cheſter, and Dr Percival of Mancheſter. It alſo induced an unknown ſufferer under the diſeaſe to write Dr Heberden a very ſenſible letter, deſcribing his feelings in the moſt natural manner; which, unfortunately, in three weeks after the date of this anonymous epiſtle, terminated in a ſudden death, as the writer himſelf had apprehended.

The youngeſt ſubject that Dr Fothergill ever ſaw afflicted with this diſorder was about 30 years of age; and this perſon was cured. The method that ſucceeded with him was a courſe of pills, compoſed of the maſs of gum pill, ſoap, and native cinnabar; with a light chalybeate bitter: this was continued for ſome months, after which he went to Bath ſeveral ſucceſſive ſeaſons, and acquired his uſual health: he was ordered to be very ſparing in his diet; to keep the bowels open; and to uſe moderate exerciſe on horſeback, but not to take long or fatiguing walks.

The only ſymptom in this patient that is mentioned, was a ſtricture about the cheſt, which came on if he was walking up hill or a little faſter than ordinary, or if he was riding a very briſk trot; for moderate exerciſe of any kind did not affect him: and this uneaſy ſenſation always obliged him to ſtop, as he felt himſelf threatened with immediate death if he had been obliged to go forward.

It is the ſharp conſtrictive pain acroſs the cheſt, that (according to Dr Fothergill's obſervation) particularly marks this ſingular diſeaſe; and which is apt to ſupervene upon a certain degree of muſcular motion, or whatever agitates the nervous ſyſtem.

In ſuch caſes as fell under the inſpection of Dr Fothergill, he very ſeldom met with one that was not attended with an irregular and intermitting pulſe; not only during the exacerbations, but often when the patient was free from pain and at reſt: but Dr Heberden obſerves, that the pulſe is, at leaſt ſometimes, not diſturbed; and mentions his having once had an opportunity of being convinced of this circumſtance, by feeling the pulſe during the paroxyſm.

But no doubt theſe varieties, as well as many other little circumſtances, will occur in this diſeaſe as they do in every other, on account of the diverſity of the human frame; and if thoſe which in general are found to predominate and give the diſtinguiſhing character be preſent, they will always authoriſe us in giving the name to the diſeaſe: thus, when we find the conſtrictory pain acroſs the cheſt, accompanied with a ſenſe of ſtrangling or ſuffocation; and ſtill more, if this pain ſhould ſtrike acroſs the breaſt into one or both arms; we ſhould not heſitate to pronounce the caſe an *angina pectoris*.

As to the nature of this diſeaſe, it appears to be purely ſpaſmodic: and this opinion will readily preſent itſelf to any one who conſiders the ſudden manner of its coming on and going off; the long intervals of perfect eaſe; the relief afforded by wine, and ſpirituous cordials; the influence which paſſionate affections of the mind have over it; the eaſe which comes from varying the poſture of the head and ſhoulders, or from remaining quite motionleſs; the number of years for which it will continue, without otherwiſe diſordering health; its bearing ſo well the motion of a horſe or carriage, which circumſtance often diſtinguiſhes ſpaſmodic pains from thoſe which ariſe from ulcers; and laſtly, its coming on for the moſt part after a full meal, and in certain patients at night, juſt after the firſt ſleep, at which time the incubus, convulſive aſthma, and other ills, juſtly attributed to the diſordered functions of the nerves, are peculiarly apt to return or to be aggravated.

From all theſe circumſtances taken together, there can be little doubt that this affection is of a ſpaſmodic nature: but though it ſhould be admitted, that the whole diſtreſs in theſe caſes ariſe from ſpaſm, it may not be ſo eaſy to aſcertain the particular muſcles which are thus affected.

The violent ſenſe of ſtrangling or choaking, which ſhows the circulation through the lungs to be interrupted during the height of the paroxyſm; and the peculiar conſtrictive pain under the ſternum, always inclining (according to Dr Heberden's obſervation) to the left-ſide; together with that moſt diſtreſſing and alarming ſenſation, which, if it were to increaſe or continue, threatens an immediate extinction of life; might authoriſe us to conclude that the heart itſelf is the muſcle affected: the only objection to this idea, and, if it had been conſtantly obſerved, it would be inſurmountable, is, that the pulſe is not always interrupted during the paroxyſm. The appearances in two of the diſſections, favour the opinion that the ſpaſm affects the heart; as in one ſubject the left ventricle (and, though it be not mentioned, we may preſume the right one alſo) was found as empty of blood as if it had been waſhed; and in another, the ſubſtance of the heart appeared whitiſh, not unlike a ligament; as it ſhould ſeem, in both caſes, from the veſſels and force of the ſpaſms ſqueezing the blood out from the cavities.

If this hypotheſis be allowed, we muſt conclude that the ſpaſm can only take place in an inferior degree, as long as the patient continues to ſurvive the paroxyſm; ſince an affection of this ſort, and in this part, of any conſiderable duration or violence, muſt inevitably prove fatal: and accordingly, as far as could be traced, the perſons who have been known to labour under this diſeaſe have in general died ſuddenly.

The diſſections alſo ſhow, that whatever may be the true ſeat of the ſpaſm, it is not neceſſary for the bringing of it on, that the heart, or its immediate appendages, ſhould be in a morbid ſtate; for in three out of the ſix that have as yet been made public, theſe parts were found in a ſound ſtate.

On opening the body of the poor gentleman who wrote the letter to Dr Heberden, "upon the moſt careful examination, no manifeſt cauſe of his death could be diſcovered; the heart, in particular, with its veſſels and valves, were all found in a natural condition."

In the caſe communicated by Dr Percival to the publiſhers of the Edinburgh Medical Commentaries, "the heart and aorta deſcendens were found in a ſound ſtate."

And in Dr Haygarth's patient, "on opening the thorax, the lungs, pericardium, and heart, appeared perfectly ſound." Not to mention Dr Fothergill's patient (R. M.), in whoſe body the only morbid appearance about the heart was a ſmall white ſpot near the apex. So that the cauſe, whatever its nature might have been, was at too great a diſtance, or of too ſubtile a nature, to come under the inſpection of the anatomiſt. But there was a circumſtance in two of the ſubjects that is worthy of remembrance; and which ſhows that the craſis of the blood, while they were living, muſt have been greatly injured, namely, its not coagulating, but remaining of a cream-like conſiſtence, without any ſeparation into ſerum and craſſamentum.

From all that we have ſeen hitherto publiſhed, it does not appear that any conſiderable advances have been made towards the actual cure of this anomalous ſpaſm.

The very judicious and attentive Dr Heberden (to whom the public are highly indebted for firſt making the diſorder known) confeſſes, that bleeding, vomits, and other evacuations, have not appeared to do any good: wine and cordials, taken at bed-time, will ſometimes prevent or weaken the fits; but nothing does this ſo effectually as opiates: in ſhort, the medicines uſually called *nervous* or *cordial*, ſuch as relieve and quiet convulſive motions, and invigorate the languiſhing principle of life, are what he recommends.

Dr Wall mentions one patient, out of the 12 or 13 that he had ſeen, who applied to him early in the diſeaſe, and was relieved conſiderably by the uſe of antimonial medicines joined with the fetid gums: he was ſtill living at the time the Doctor wrote his paper, (November 1772), and going about with tolerable eaſe. Two were carried off by other diſorders; all the reſt died ſuddenly.

Dr Fothergill's directions are chiefly calculated with the view to prevent the diſorder from gaining ground, and to alleviate preſent diſtreſs. Accordingly he enjoins ſuch a kind of diet as may be moſt likely to prevent irritability: in particular, not to eat voraciouſly: to be particularly abſtemious in reſpect to every thing heating; ſpices, ſpirits, wines, and all fermented liquors: to guard moſt ſcrupulouſly againſt paſſion, or any vehement emotions; and to make uſe of all the uſual means of eſtabliſhing and preſerving general health: to mitigate exceſſes of irritability by anodynes; or pains, if they quicken the circulation: to diſperſe flatulencies when they diſtend the ſtomach, by moderate doſes of carminatives; amongſt which, perhaps, ſimple peppermint water may be reckoned one of the ſafeſt. But ſince obeſity is juſtly conſidered as a principal prediſpoſing cauſe, he inſiſts ſtrongly on the neceſſity of preventing an increaſe of fat, by a vegetable diet, and uſing every other practicable method of augmenting the thinner ſecretions.

Theſe were the only means which occurred to the Engliſh phyſicians of oppoſing this formidable diſeaſe: but Dr Smyth of Ireland has, we are told, diſcovered that it may be certainly cured by iſſues, of which Dr Macbride gives the following inſtance.

“ *A. B.* a tall, well made man: rather large than otherwiſe; of healthy parents, except that there had been a little gout in the family; temperate; being very attentive to the buſineſs of his trade (that of a watch-maker), led a life uncommonly ſedentary; had, from his boyhood upwards, been remarkably ſubject to alarming inflammations of this throat, which ſeized him, at leaſt, once in courſe of the year; in all other reſpects well.

“ In 1767, (then 48 years of age), he was taken, without any evident cauſe, with a ſudden and very diſpiriting throbbing under the ſternum. It ſoon afterwards increaſed, and returned upon him every third or fourth week, accompanied with great anxiety, very laborious breathing, choaking, a ſenſation of fulneſs and diſtention in the head, a bloated and fluſhed countenance, turgid and watery eyes, and a very irregular and unequal pulſe. The paroxyſm invaded, almoſt conſtantly, while he was ſitting after dinner; now and then he was ſeized with it in the morning, when walking a little faſter than uſual; and was then obliged to ſtop, and reſt on any object at hand. Once or twice it came on in bed; but did not oblige him to ſit up, as it was then attended with no great difficulty in breathing. In the afternoon fits his greateſt eaſe was from a ſupine poſture; in which he uſed to continue motionleſs for ſome hours, until, quite ſpent and worn out with anguiſh, he dropt into a ſlumber. In the intervals between theſe attacks, which at length grew ſo frequent as to return every fourth or fifth day, he was, to appearance, in perfect health.

“ Thus matters continued for more than two years; and various antiſpaſmodics were ineffectually tried for his relief. In 1769, there ſupervened a very ſharp conſtrictory pain at the upper part of the ſternum, ſtretching equally on each ſide, attended with the former ſymptoms of anxiety, dyſpnœa, choaking, &c. and with an excruciating cramp, as he called it, that could be covered with a crown-piece, in each of his arms, between the elbow and the wriſt, exactly at the inſertion of the pronater teres; the reſt of the limb was quite free. The fits were ſometimes brought on, and always exaſperated, by any agitation of mind or body. He once attempted to ride on horſeback during the paroxyſm; but the experiment was near proving fatal to him. The difference of ſeaſon or weather made no impreſſion upon him. Still, in the intervals, his health was perfectly good; except that his eyes, which before his illneſs were remarkably ſtrong and clear, were now grown extremely tender; and that his ſight was much impaired. He had no flatulency of ſtomach, and his bowels were regular.

“ In this ſituation, February 22. 1770, he applied to me for aſſiſtance. I had ſeen, I believe, eight or ten of theſe frightful caſes before. Two of the patients dropt dead ſuddenly. They were men between 40 and 50 years of age, and of a make ſomewhat fleſhy. The fate of the others I was not informed of; or, at leaſt, cannot now recollect.

“ Having found the total inefficacy of bliſters and the whole claſs of nervous medicines in the treatment of this anomalous ſpaſm, I thought it right to attempt the correcting or draining off of the irritating fluid in the caſe now before us. To this purpoſe, I ordered a mixture of lime-water with a little of the compound juniper-water, and an alterative proportion of Huxham's antimonial wine: I put the patient on a plain, light, perſpirable diet; and reſtrained him from all viſcid, flatulent, and acrimonious articles. By purſuing this courſe, he was ſoon apparently mended; but after he had perſiſted regularly in it for at leaſt two months, he kept for ſome time at a ſtand. I then ordered a large iſſue to be opened on each of his thighs. Only one was made. However, as ſoon as it began to diſcharge, his amendment manifeſtly increaſed. The frequency and ſeverity of the fits abated conſiderably; and he continued improving gradually, until, at the end of 18 months he was reſtored to perfect health; which he has enjoyed, without the leaſt interruption, till now, except when he has been tempted (perhaps once in a twelvemonth) to tranſgreſs rules, by making a large meal on ſalted meat, or indulging himſelf in ale or rum-punch, each of which never failed to diſorder

order him from the beginning of his illneſs: and even on theſe occaſions he has felt no more than the ſlighteſt motion of his former ſufferings; inſomuch that he would deſpiſe the attack, if it did not appear to be of the ſame ſtock with his old complaint. No other cauſe has had the leaſt ill effect on him.

"Though rum was conſtantly hurtful, yet punch made with a maceration of black currants in our vulgar corn-ſpirit, is a liquor that agrees remarkably well with him.

"He never took any medicine after the iſſue began to diſcharge; and I have directed that it ſhall be kept open as long as he lives. The inflammations of his throat have diſappeared for five years paſt; he has recovered the ſtrength and clearneſs of his ſight; and his health ſeems now to be entirely re-eſtabliſhed."

Dr Macbride, in a letter to Dr Duncan, publiſhed in the Edinburgh Medical Commentaries, gives the following additional obſervations on this diſeaſe.

"Within theſe few weeks I have, at the deſire of Dr Smyth, viſited, three or four times, a very ingenious man who keeps an academy in this city, of about 34 years of age, who applied to the Doctor for his advice in January laſt.

"I ſhall give you his ſymptoms as I had them from his own mouth, which appear to me to mark his caſe to be an angina pectoris, and as deplorable as any that I have read of. It was ſtrongly diſtinguiſhed by the exquiſite conſtrictory pain of the ſternum, extending to each of his arms as far as the inſertion of the deltoid muſcle, extreme anxiety, laborious breathing, ſtrangling, and violent palpitation of the heart, with a moſt irregular pulſe. The paroxyſms were ſo frequent, that he ſcarcely ever eſcaped a day, for ſix or ſeven years, without one. They were uſually excited by any agitation of mind or body, though ſlight. He had clear intervals of health between the fits. The diſtemper ſeems hereditary in him, as he ſays his father was affected in the ſame manner ſome years previous to his death. He has a ſtrong gouty taint, which never ſhowed itſelf in his limbs; and he has led a life of uncommon ſedentarineſs, from intenſe application to mathematical ſtudies, attention of mind, and paſſion, even from his boyiſh years. Theſe circumſtances may, perhaps, account for his having been taken with this diſeaſe at ſo early an age as 17.

"A large iſſue was immediately opened in each of his thighs. In a month afterwards he began to mend, and has gone on improving gradually. He can now run up ſtairs briſkly, as I ſaw him do no later than yeſterday, without hurt: can bear agitation of mind; and has no complaint, excepting a ſlight oppreſſion of the breaſt, under the ſternum, which he feels ſometimes in a morning, immediately after dreſſing himſelf, and which he thinks is brought on by the motion uſed in putting on his clothes; though for a complete week preceding the day on which I ſaw him laſt, he told me that he had been entirely free from all uneaſineſs, and was exulting that he had not had ſuch an interval of eaſe for theſe laſt ſeven years.

"Doctor Smyth alſo ſhowed me, in his *adverſaria* the caſe of a gentleman who had been under his care in 1760, which he had forgotten when my book went to the preſs, and which he was reminded of the other day by a viſit from his patient. It was a genuine angina pectoris, brought on by a very ſedentary life, and great vexation of mind, clearly marked by the exquiſite pain under the ſternum, that extended acutely to the upper extremities, particularly along the left arm, together with the other ſymptoms of dyſpnœa, anxiety, palpitation of the heart, &c. recited in the caſe above. The diſorder went off in 1762, by large ſpontaneous diſcharges from the piles, but returned upon him ſeverely in 1765. Iſſues in his thighs were then recommended to him, but not made. But, whether it was by the perſuaſion of ſome friend, or of his own accord, he went into a courſe of James's powder, in ſmall alterative doſes, combined with a little caſtor and aſafœtida. This he perſiſted in for about ſix weeks; in the meanwhile, he had large acrimonious gleetings from the ſcrotum, and a plentiful diſcharge of ichor from the anus.—From this time he began to find his complaints grow leſs and leſs diſtreſſing, and he has now been totally free from them for ſix years paſt."

The PUERPERAL, or CHILD-BED FEVER. 404

THIS ſpecies of fever, as its name imports, is peculiar to women in child-bed; and is uſually the moſt fatal of all the diſorders to which the ſex is liable. But, notwithſtanding the prevalence of it in all ages, its real nature has remained, to the preſent time, a ſubject of much diſpute and uncertainty. The critical period of its invaſion, when febrile commotions are apt to be excited by various accidents, and equivocal ſymptoms which accompany it, have even afforded room for queſtioning whether it be a primary or a ſecondary diſeaſe. Some writers have conſidered it as proceeding entirely from an inflammaion, of the uterus; others have imagined it to be the conſequence of an obſtruction to the ſecretion of the milk; while the greater number has been inclined, for reaſons equally if not more plauſible, to impute it to a ſuppreſſion of the lochia. If we examine this fever attentively, however according to its natural courſe, and independently of all the accidental concomitant ſymptoms with which it is not eſſentially connected, we may ſafely pronounce it to be a primary diſeaſe of a particular characteriſtic, and perhaps not the neceſſary conſequence of any of the cauſes abovementioned.

This fever is moſt generally incident to women within 48 hours after delivery, though it may ſupervene on the fourth or fifth day, and ſometimes conſiderably later. It is preceded, like other fevers, by a rigor, which is commonly violent; and, when happening during the time of labour, may be confounded with the pains of parturiency. In its earlier ſtage it is attended with the ſigns of inflammation. A great pain is felt in the back, hips, and the region of the uterus; which, in the part laſt mentioned, is accompanied with the ſenſe of heat and throbbing. A ſudden change in the quality or quantity of the lochia now alſo takes place; the patient is frequently troubled with a teneſmus; and the urine, which is very high coloured, is diſcharged in ſmall quantity and with pain. At the firſt attack of the fever, the woman is generally ſeized with a vomitting of porraceous matter, as in the *cholera morbus*, to which diſeaſe it then bears a ſtrong reſemblance.—But inſtead of this ſymptom, there is ſometimes only a nauſea, or loathing at the ſtomach, with a diſagreeable taſte in the mouth. The belly ſwells to a conſiderable bulk, and becomes ſuſceptible of painful ſenſations from the ſlighteſt impreſſion. The tongue is generally dry, though ſometimes moiſt, and covered with a thick browniſh fur. When the fever has continued a few days, the ſymptoms of inflammation uſually ſubſide, and the diſeaſe acquires a more putrid form. At this period, if not at the very beginning of the diſorder, a bilious or putrid diarrhœa, of a dangerous and obſtinate nature, ſupervenes, and accompanies it through all its future progreſs; each motion to ſtool being preceded by a temporary increaſe, and followed by an allevation of pain. The patient uſually nauſeates all kind of food and drink, except what is cold and acidulated. A brown or blackiſh ſordes, the conſequence of putrid exhalations, adheres to the edges of the teeth; a troubleſome hiccough is at length produced, which greatly exaſperates the pains of the abdomen; petechiæ or vibices alſo appear, with ſometimes a miliary eruption, but which produces no mitigation of the diſeaſe. Through the whole courſe of the fever the patient is affected with great anxiety and dejection of ſpirits.

Such in general is the courſe of the puerperal fever; the ſymptoms of which, however, may be often varied according to the conſtitution of the patient, the degree of the diſeaſe, and its earlier or later invaſion. When the woman is naturally weak, or her ſtrength has been greatly reduced by immoderate evacuations after delivery; when the diſeaſe is violent, and immediately follows that period; its progreſs and termination are proportionably rapid and fatal. In ſuch unfortunate circumſtances, many have been known to expire within 24 hours from the firſt attack of the diſeaſe; nay, there are ſome inſtances where the rigor has concluded the ſcene. The cataſtrophe, however, is moſt generally ſuſpended for ſome days; and the number of theſe is variable, though the 11th from commencement of the fever may juſtly be fixed as the period which is uſually deciſive. In whatever ſtage of the diſeaſe an unfavourable termination may happen, it would ſeem as if the commencement of the patient's recovery were not marked by any critical revolution of the fever, as depending on an alteration of the humors; but that the cure is gradually effected, either by a ſpontaneous vomiting, or a long-continued diſcharge by ſtool of that porraceous matter, the exiſtence of which in the ſtomach is uſually evinced at the firſt attack of the diſeaſe. The moſt unfavourable prognoſtic, therefore, ariſes from ſuch a weakneſs of the patient as renders her unable to ſupport ſo tedious an evacuation as that by which the fever is overcome. When the lochia return to their former ſtate, when the ſwelling and tenderneſs of the abdomen abate, and there is a moiſture on the ſkin, we have reaſon to hope for a happy termination of the diſeaſe.

Though the puerperal fever may generally be aſcertained from the deſcription which has been given, and chiefly by that remarkable tenderneſs of the abdomen; which particularly diſtinguiſhes it; yet, as ſome of its ſymptoms may be confounded with thoſe ariſing from other diſeaſes, and which require a different method of cure, it will be proper to mention here the circumſtances whereby it may be known with greater certainty.

The pains of the abdomen, attending the child-bed fever, may be diſtinguiſhed from thoſe called *after-pains*, by their uninterrupted continuance through the courſe of the diſeaſe, though ſometimes they ſuffer exacerbations; whereas, in the latter, they often totally intermit. They are alſo diſtinguiſhable by the abſence of fever with concomitant ſymptoms in the one, and their evident exiſtence in the other.

Many circumſtances evince a diſſimiliarity between the puerperal and miliary fevers, notwithſtanding the ſymptoms of anxiety and oppreſſion are common to both; inſomuch that the nature of the approaching diſeaſe may be aſcertained at the very commencement of its attack. In the puerperal fever the rigor is more violent, of longer duration, and not interrupted, as in the other. The pulſe is fuller and ſtronger; the ſkin is more hot; and the tongue, whether moiſt or dry, though generally the latter, is not of a white, but browniſh appearance; and the urine is alſo higher coloured. Eruptions, which are critical in miliary fevers, procure no mitigation of the puerperal fever, and cordials generally increaſe it.

When the original attack of the puerperal fever happens to coincide with the febrile commotion which is excited in child-bed women by the milk, the nature of it may at firſt be miſapprehended; but the concomitant ſymptoms, and greater violence of the diſeaſe, muſt in a ſhort time diſſipate ſuch an error.

From all the moſt accurate accounts of this diſeaſe, and from the period at which it generally commences, there ſeems reaſon to conclude, that it owes its riſe more immediately to accidents after delivery. For it is allowed that it may follow a labour under the beſt and moſt favourable circumſtances, though endeavours to dilate the os internum are ſuppoſed frequently to produce it. The more immediate cauſes generally aſſigned by authors are a ſtoppage of perſpiration, the too free uſe of ſpices, and the neglect of procuring ſtools after delivery; ſudden frights, too haſty a ſeparation of the placenta, and binding the abdomen too tight. The putrid appearance, however; which this diſeaſe ſo ſoon aſſumes, affords ground to ſuſpect that the prediſpoſing cauſe of it is a vitiated ſtate of the humors; for it is generally obſerved to be moſt prevalent in an unhealthy ſeaſon, and among women of a weakly and ſcorbutic conſtitution.

Within theſe few years this fever has been treated of by ſeveral writers, moſt of whom have differed from each other in their ſentiments of the nature of the diſeaſe. The firſt in the order of publication is Dr Denman, who ſeems to be of opinion, that it may derive its origin either from a redundancy or too great acrimony of the bile, the ſecretion of which appears to be much interrupted in the time of geſtation. In Dr Manning's treatiſe on this fever, he mentions its being highly probable that ſuch a cauſe contributes greatly to produce the diſeaſe, eſpecially where the putrid tendency of the humors is increaſed by unwholeſome air and diet.

It has likewiſe been the fate of the puerperal fever, that no diſeaſe has more divided the ſentiments of phyſicians in regard to the method of cure. The apparent

rent indications and contra-indications of bleeding, and other remedies, ariſing from the complication of inflammatory and putrid ſymptoms; the equivocal appearance of the vomiting and purging, as whether they be critical or ſymptomatical; and the different cauſes whence ſymptoms ſimilar to each other may ariſe in pregnant women; all theſe circumſtances concur to involve the ſubject in great obſcurity and indeciſion. If we carefully attend to the ſeveral characteriſtics of the diſeaſe, however, ſo as to be able to diſtinguiſh it from every other puerperal complaint, and obſerve at the ſame time the uſual manner of its declenſion, our judgement may be guided in the method of cure by the ſalutary efforts of nature. But, in order to obtain a clearer view of the genuine indications, it will be proper to conſider them under the ſeveral lights in which they have been generally agitated by authors.

One of the moſt eſſential points to be aſcertained in the cure of the child-bed fever, reſpects the propriety of bleeding. A free uſe of the lancet has been generally regarded as the moſt ſucceſsful expedient in practice; and there are ſome inſtances of critical hæmorrhagies which would ſeem to confirm its utility. But Dr Denman thinks we may ſafely affirm from experience, that for one who will be benifited by large bleeding, a much greater number will be injured, and that even almoſt irretrievably. Nor can this ſeem ſurpriſing, when we conſider the ſituation of child-bed women. In moſt, the evacuations conſequent upon delivery are ſufficient to diminiſh any undue ſuperabundance of the fluids; and if, as frequently happens, the diſeaſe be produced by too haſty a ſeparation of the placenta, the conſequence of which is generally a very copious diſcharge of blood, we can never ſuppoſe that nature will be aſſiſted in overcoming the febrile commotion, by the farther evacuation of the vital fluid, through the defect of which ſhe is now rendered unequal even to the ordinary ſupport of the animal œconomy. We may appeal to every practical phyſician, how much he has known the pulſe to ſink, and what a train of nervous ſymptoms he has obſerved to ſucceed an exceſs of the diſcharge abovementioned. Beſides, it is an axiom in phyſic, that a remedy which cures any diſorder, will always prove ſufficient to prevent it; and therefore, if bleeding were the proper cure in the child-bed fever, the diſeaſe ought to have been prevented by a large evacuation of blood, when that happened previous to its ſeizure. Experience, however, in this, as in all other diſeaſes, is the only unerring guide we can follow; and whoever regulates his practice by fact and obſervation, will be convinced that bleeding, eſpecially in a larger quantity, is, in general, very far from being attended with ſucceſs. Bleeding is ſeldom proper, except in women of plethoric conſtitutions, and in whom the ſigns of inflammation riſe high. Nor even in ſuch patients ought it to be repeated without great caution, and the exiſtence of ſtrong indications. Bleeding, when uſed in proper circumſtances, may unqueſtionably palliate the fever; but that it often ſhortens the duration of it, appears to be a matter of much doubt. On this account the practice becomes ſtill more ſuſpicious and exceptionable, when we conſider that by veneſection improperly uſed the perſon's ſtrength may be ſo far reduced as not to ſupport the tedious looſeneſs by which the diſeaſe is generally carried off. Though bleeding, however, ought in general to be uſed with great caution, there are certainly many caſes in which it is both neceſſary and advatageous.

The genuine nature and effects of the looſeneſs in this diſeaſe, is another controverted point of the higheſt importance, and which merits the moſt attentive inquiry. Phyſicians, obſerving that women who die of the puerperal fever are generally moleſted with that evacuation, have been induced to conſider this ſymptom as of the moſt dangerous and fatal tendency; and what, therefore, we ſhould endeavour by every means to reſtrain. In this opinion, however, they would ſeem to have been governed by too partial an obſervation of facts. For experience certainly authoriſes the aſſertion, that more women appear to have recovered of the child-bed fever, through the intervention of a diarrhœa, than have been deſtroyed by that cauſe. If it alſo be conſidered, that purging is uſually almoſt the only ſenſible evacuation in the more advanced ſtate of the diſeaſe, and is that which accompanies it to its lateſt period, we ſhall have the ſtrongeſt reaſon to think that it is critical rather than ſymptomatical, and ought therefore to be moderately ſupported, inſtead of being unwarily reſtrained. Nay, the advantage which is found to attend vomiting as well as purging, in the earlier ſtage of the diſeaſe, would ſeem to evince that the matter diſcharged by theſe evacuations is what chiefly foments the diſeaſe. Emetics and purgatives, therefore, in the opinion of Dr Manning, are the only medicines on which any rational dependence is to be placed in the fever; at leaſt, they are certainly ſuch as are found the moſt ſucceſsful. It is an eſtabliſhed rule in practice, to preſcribe a vomit at the beginning of every fever attended with any nauſea or loathing of the ſtomach, and where there is not any reaſon to apprehend an inflammation of that organ. Nor does the ſtate of child-bed women afford the ſmalleſt ground for prohibiting our recourſe to the ſame expedient in anſwering a ſimilar indication.

It is ſo ſeldom a phyſician is called during the rigor preceding the puerperal fever, that he has few opportunities of trying the effects of remedies in that early ſtate of the diſeaſe. When ſuch occur, however, we ſhould endeavour as much as poſſible to abate and ſhorten that period, as the ſucceeding fever is generally found to bear a proportion to the violence and duration of it. For this purpoſe, warm diluting drinks ſhould be plentifully uſed, with a ſmall quantity of volatile ſpirits or brandy. When Dr Manning apprehended ſuch an accident, he ſometimes ordered the nurſe to give immediately a diſh or two of warm ſack-whey; taking care that it was not too ſtrong, which is a caution that ought always to be remembered: for though a freer uſe of the more cordial and ſpirituous kinds of liquors might perhaps ſoon abate the rigor, there is danger to be feared from their influence on the approaching fever, eſpecially in women of a ſtrong and healthy conſtitution. In all caſes, warm applications to the extremities, ſuch as heated bricks, towels, or toaſted grains in a linen bag, may be uſed with perfect ſafety, and ſome advantage.

When the hot fit is advanced, the firſt thing Dr Manning orders is ſome emollient injection, as chicken-

Puerperal Fever.

water, or water and milk, which ought to be frequently repeated through the courſe of the diſeaſe. Theſe prove beneficial, not only by promoting the diſcharge from the inteſtines, which ſeems in fact to be the ſolution of the diſeaſe; but alſo by acting as a kindly fomentation to the uterus and adjacent parts. With this intention they are particularly ſerviceable when the lochia are ſuppreſſed. Great care, however, is requiſite in adminiſtering them, on account of the tenderneſs and inflammatory diſpoſition, which at that time render the parts in the pelvis extremely ſuſceptible of pain.

The next ſtep in the method of cure ought to be to promote the diſcharge of the morbid matter both by the ſtomach and inteſtines. This intention is beſt anſwered by the remedy preſcribed by Dr Denman, of which the following is the receipt.

R. Tartar. emetic. gr. ii.
Ocul. cancror. præp. ℈i. Intimè miſceantur.

Of a powder thus prepared, Dr Denman gives from two to ſix grains, and repeats it as circumſtances require. If the firſt doſe do not procure any ſenſible operation, he repeats it in an increaſed quantity at the end of two hours, and proceeds in that manner; not expecting any benefit but from its ſenſible evacuation.

Should the diſeaſe be abated, but not removed, (which ſometimes happens), by the effect of the firſt doſe, the ſame medicine muſt be repeated, but in a leſs quantity, till all danger be over. But if any alarming ſymptoms remain, he does not heſitate one moment to repeat the powder, in the ſame quantity as firſt given; though this be ſeldom neceſſary, if the firſt doſe operates properly.

It is to be obſerved, ſays Dr Denman, that as the certainty of cure depends upon the proper repetition of the medicine, the method of giving it at ſtated hours does not appear eligible. If the firſt doſe produce any conſiderable effect by vomiting, procuring ſtools, or plentifully ſweating, a repetition of the medicine in a leſs quantity will ſeldom fail to anſwer our expectations; but great judgment is required in adapting the quantity firſt given to the ſtrength of the patient and other circumſtances. We are not to expect that a diſeaſe which from the firſt formation carries ſo evident marks of danger, ſhould inſtantly ceaſe, even though a great part of the cauſe be removed.

Frequent doſes of the ſaline draughts ought alſo to be given, which not only promote the evacuation by the inteſtines, but likewiſe increaſe the ſalutary diſcharges of urine and perſpiration. Theſe medicines are particularly ſerviceable in ſubduing the remains of the fever, after its violence has been broken by the more efficacious remedies abovementioned; but when they are uſed even in the decline of the diſeaſe, gentle laxatives of rhubarb and magneſia, as adviſed by Dr Denman, ought to be frequently interpoſed, ſince, as he juſtly obſerves, without ſtools we can do little ſervice.

Notwithſtanding the diſcharge by the inteſtines appears to have the moſt ſalutary effect in this diſeaſe, yet when the ſtomach has not been properly unloaded of offenſive matter, though a great nauſea and ſickneſs had indicated the expediency of ſuch an evacuation at the beginning of the fever, the continuance of the looſeneſs is ſometimes ſo long protracted as in the end to prove fatal. In this alarming ſtate of the diſeaſe, when the ſtools are very frequent and involuntary, and all appearances threaten danger, Dr Denman ſays, that a clyſter of chicken-water injected every one, two or three hours, or as often as poſſible without fatiguing the patient too much, with the following draught taken every ſix hours, has produced better effects than could be expected.

R. Pulv. rad. ipecacuan. gr. i.
Confect. Damocrat. ℈i.
Aq. alexiter. ſimp. vel.
Cinnamom. ſimp. ℥iſs. M. f. Hauſtus.

While theſe medicines are uſing, we ſhould endeavour to mitigate the pains of the belly by relaxing applications. During the courſe of the diſeaſe, the patient ought to drink freely of diluting liquors, and abſtain from every thing of a heating quality, unleſs great faintneſs ſhould indicate the uſe of a ſmall quantity of ſome cordial medicine.

Such is the practice recommended in this diſeaſe by Dr Denman. We ſhall now take a curſory view of the ſentiments of ſucceeding writers on this ſubject.

According to Dr Hulme, the proximate cauſe of the puerperal fever is an inflammation of the inteſtines and omentum; for the confirmation of which opinion he appeals to diſſections. He ſuppoſes the chief prediſponent cauſe of the diſeaſe to be the preſſure of the gravid uterus againſt the parts abovementioned. The omentum, ſays he, in the latter ſtage of pregnancy, muſt either be flat, which is its natural ſituation, or be rumpled or carried up by the gravid uterus in folds or doublings. When the latter is the caſe, which he obſerves is probably not ſeldom, the danger of a ſtrangulated circulation will be greater.

Mr White, who has alſo written on this diſeaſe, judiciouſly remarks, that were Dr Hulme's hypotheſis well founded, the diſorder ought rather to take place before delivery, and be immediately removed at that period: That it would likewiſe moſt generally happen to women at their firſt labour, when the abdominal muſcles are leſs yielding, and the pains more violent; the contrary of which is moſt frequently experienced to be the caſe.

It alſo deſerves to be remarked, that, upon Dr Hulme's ſuppoſition, we cannot account for the diſeaſe being more common and fatal in large towns and in hoſpitals, than in the country and private practice, while other inflammatory diſorders are more endemic among thoſe who live in the latter than the former ſituation. Even admitting the friction of the inteſtines and omentum againſt the uterus to be as violent as Dr Hulme ſuppoſes, is it not highly improbable, that any inflammation could be occaſioned by the preſſure of ſuch ſoft ſubſtances upon each other? Or, were this effect really produced, ought not the puerperal fever to be more common and fatal after the moſt laborious deliveries? But this obſervation is not ſupported by experience.

Dr Hulme, in favour of his own hypotheſis, alleges that it gives a ſatisfactory anſwer to the queſtion, "Why all lying-in women have been, and ever will be, ſubject to this diſeaſe?" In this propoſition, however, the Doctor ſuppoſes ſuch an univerſality of the diſeaſe as is not confirmed by obſervation. It is affirmed

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firmed upon undoubted authority, that in many parts of Britain the puerperal fever is hardly known; whereas, were it really produced by the cauſes he aſſigns, it would be equally general and unavoidable.

But how peculiar ſoever this author's ſentiments are in reſpect of the proximate cauſe of this diſeaſe, they have not led him to any method of cure different from the eſtabliſhed practice. On this ſubject Dr Hulme divides his obſervations into two parts, comprehending under the former the more ſimple method of treatment, and under the latter the more complex. He ſet out with remarking, that the patient being generally coſtive at the beginning of the diſeaſe, an emollient opening clyſter will often give immediate relief; but if this ſhould not prove effectual, recourſe muſt be had to cathartics. Thoſe which he found anſwer his pupoſe beſt, were the *ſal catharticus amarus*, the *oleum ricini*, emetic tartar, and antimonial wine. When the bowels have been ſufficiently cleared and the pain abates, he adviſes encouraging a gentle diaphoreſis by medicines which neither bind the body nor are heating; ſuch as a ſmall doſe of ipecacuan, emetic tartar, and antimonial wine, combined with an opiate in a moderate doſe, and given once or twice in the courſe of 24 hours; adminiſtering the ſaline draughts in the intermediate ſpaces. If, preceding or during this courſe, a ſickneſs at ſtomach or vomiting attend, he adviſes aſſiſting the efforts of nature, by drinking plentifully of camomile tea, warm water, or any other diluting liquor. He concludes with recommending a cooling regimen, reſt of body, and tranquillity of mind; prohibiting all kinds of bandages upon the abdomen, and enjoining particular attention to the ſtate of the bowels, which ought to be kept gently open for ſome time, even after the diſorder ſeems to be gone off, till the patient be quite out of danger.

So much for the ſimple treatment: we now proceed to the ſecond part, where he deſcribes the method of practice when the diſeaſe is in its more irregular and complicated ſtate.

When a diarrhœa accompanies the diſeaſe, he obſerves that it ought by no means to be checked, but ſupported, by ordering the patient to drink plentifully of mild aperient liquors. If the pain of the hypogaſtric region be attended with ſtitches in the ſides or over the pit of the ſtomach, and a pulſe that reſiſts the finger pretty ſtrongly, he remarks that bleeding would then be highly neceſſary: declaring, however, his opinion, that in the puerperal fever, bleeding is to be conſidered only as a ſecondary means of relief, though the firſt in point of time; that it ought to be adviſed with great caution; and that the greateſt dependence is always to be placed upon evacuations by ſtool.

Mr White, abovementioned, imputes the puerperal fever to a putreſcent diſpoſition of the humours, contracted during pregnancy, and fomented by the hot regimen commonly uſed by women in child-bed. In conformity to this opinion, the chief means which he recommends for preventing the diſeaſe is a cool regimen and free circulation of air, which he evinces to be of the greateſt importance. In reſpect of bleeding, he informs us, that, upon the ſtricteſt inquiry, he cannot find that thoſe who have bled the moſt copiouſly have had the greateſt ſucceſs, either in private or hoſpital practice. He even ſeems to queſtion the propriety of this evacuation in any caſe; but approves of emetics, cathartics, and clyſters, for cleaning the *primæ viæ*, and likewiſe of ſuch medicines and diet as will correct the putrid humours: adding, that an upright poſture and free ventilation are at all times uſeful, and abſolutely neceſſary, both for the prevention and cure of the diſeaſe.

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Another writer who treats of the child-bed fever is Dr Leake, who has publiſhed the reſult of his obſervations on this diſeaſe from April 1768 to the autumn of the year 1770; but chiefly from December 1769 to May 1770, during which period the child-bed fever prevailed much about London.

Dr Leake tells us that this fever generally commenced the evening of the ſecond or morning of the third day after delivery, with a rigor or ſhivering fit. Sometimes it invaded ſoon after delivery; and at other times, though rarely, it has ſeized ſo late as the fifth or ſixth day. Now and then it ſeemed to be occaſioned by catching cold, or by errors in diet; but oftener by anxiety of mind. Sometimes the thirſt was great; tho' the tongue had, in general, a better appearance at the beginning than is common in other fevers. It was ſeldom ever black or very foul; but, as the diſeaſe advanced, became white and dry, with an increaſe of thirſt; and at laſt was of a browniſh colour towards the root, where it was ſlightly covered with an inſpiſſated mucus. The loſs of ſtrength was ſo great and ſudden, that few of the patients could turn in bed without aſſiſtance, even ſo early as the firſt or ſecond day after the attack. The lochia, from firſt to laſt, were not obſtructed, nor deficient in quantity; neither did the quality of this diſcharge ſeem to be in the leaſt altered from its natural ſtate; a preſumption, ſays the author, that the uterus was not at all affected. Of this he was covinced by making a conſiderable preſſure above the pubes with the hand, which did not occaſion pain; but when the ſame degree of preſſure was applied higher, between the ſtomach and umbilical region, it became almoſt intolerable. A perfect criſis ſeldom if ever happened in this fever, which he imputes to the great oppreſſion of the vital powers, whereby they were rendered unable to produce ſuch an event. When the diſeaſe proved mortal, the patient generally died on the 10th or 11th day from the firſt attack. In thoſe who died of the fever, the omentum was found ſuppurated; an inflammation of which part, or of the inteſtines, Dr Leake concludes to be the proximate cauſe of the diſeaſe.

In conſequence of this idea of the cauſe of the diſeaſe, Dr Leake affirms that veneſection is the only remedy which can give the patient a chance for life. But, though it be the principal reſource to be depended upon at the beginning of the fever, he obſerves that it will ſeldom prove of ſervice after the ſecond or third day; and, if directed yet later, will only weaken and exhauſt the patient; when, matter having begun to form in the omentum, the progreſs of the diſeaſe can no longer be prevented by that evacuation. At this period the blood begins to be tainted by the abſorption of the purulent fluid; and the fever, from being inflammatory, is changed into a putrid nature.

After bleeding in ſuch a quantity as the ſymptoms require, he adviſes that the corrupted bile be evacuated and corrected as ſoon as poſſible; that the diar-

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rhœa, when exceſſive, be reſtrained by emollient anodyne clyſters and gentle ſudorifics, or even by opiates and mild aſtringents, when the patient's ſtrength begins to ſink under the diſcharge; and laſtly, that where the ſigns of the putreſaction or intermiſſion take place, antiſeptics and the Peruvian bark may be adminiſtered.

The great uniformity of the ſymptoms in all Dr Leake's patients might authoriſe an opinion, that the fever which he deſcribes was in a great meaſure a diſeaſe *ſui generis*, and depended much upon the conſtitution of the air preceding and during the period in which the fever prevailed.

Dr Kirkland has alſo made judicious obſervations on this ſubject. He rejects the opinion that the puerperal fever is a diſeaſe *ſui generis*, and ariſes always from the ſame cauſe. The particular ſituation of child-bed women, he acknowledges, occaſions a ſimilarity in the appearance of all the febrile ſymptoms: but he affirms that the ſame kind of fever may be produced by various cauſes; for inſtance, by an inflammation of the uterus or abdomen, by putrid blood or other matter, and putrid miaſms. The ſymptoms, he obſerves, will vary according to the time of ſeizure. If the fever happens in three or four days after delivery, all the ſymptoms uſual to the ſituation of the patient will make their appearance; but if it do not invade till the milk has been ſecreted, and the lochial diſcharge be nearly finiſhed, the ſymptoms, if the breaſts are properly drawn, will, for the moſt part, be thoſe only which are common to that kind of diſorder by which the fever has been produced.

With reſpect to the cure of puerperal fevers, Dr Kirkland adviſes the antiphlogiſtic method when they ariſe from inflammation; but when this method fails of ſucceſs, and a diarrhœa ſupervenes, the diſeaſe has changed its nature, having become more or leſs putrid, and requires a very different treatment.

His obſervations relative to the management of the diarrhœa merit attention. No one, ſays he, would purge and bleed to cure the colliquative fever ariſing from the abſorption of matter in large wounds; and yet the only difference is, that in the puerperal fever the matter abſorbed from the uterus, &c. acts with more violence, becauſe the blood is commonly thinner and the habit in a more irritable ſtate. We ſee, continues he, that abſorbed matter purges as effectually as if any purging medicine had been given by the mouth; and may we not therefore do harm by additional purging, when there has been a large evacuation, eſpecially as purges in this caſe are incapable of entirely removing the *fomes morbi?*

He conſiders the Peruvian bark as the principal remedy, as ſoon as the pulſe ſinks, the heat is leſſened, and the ſtomach will bear it. If the bark increaſe the diarrhœa beyond moderation, he joins with it ſmall doſes of laudanum; but if the diarrhœa ſhould entirely ſtop without the fever going off, in place of laudanum he adviſes a proper quantity of rhubarb. Should the diarrhœa, notwithſtanding the uſe of the medicines propoſed, become ſo violent as to endanger the patient, he joins Mr White in recommending the columbo root, which is a warm cordial, and removes the irritability of the ſtomach and inteſtines more powerfully than any other bitter he knows.

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Of this diſeaſe alſo, as it appeared in Derbyſhire and ſome of the adjacent provinces, an account has been publiſhed by Dr Butter. Concerning the cauſes and nature of the diſeaſe, he obſerves, that pregnancy ſeems to add much to the natural ſenſibility of the female conſtitution; becauſe at this period women are often ſubject to a train of nervous ſymptoms, which never moleſt them at other times. During geſtation likewiſe, the appetite is for the moſt part keen, while the digeſtion appears to be impaired; and this weakneſs is increaſed not only by improper food, of which the woman is frequently deſirous, but alſo by the inactivity attending her ſituation. To theſe circumſtances, it is added, that the inteſtinal paſſage being interrupted by the uterine preſſure, coſtiveneſs generally prevails. From the ſeveral obſervations here enumerated, Dr Butter concludes, that the proximate cauſe of the puerperal fever is a ſpaſmodic affection of the firſt paſſages, with a morbid accumulation in their cavity; and upon this ſuppoſition he endeavours to account for the various ſymptoms of the diſeaſe.

In treating of the method of cure, he lays down two indications; the former of which is to promote two, three, or four ſtools daily, in a manner ſuited to the ſtrength of the patient, till ſuch time as they reſume a natural appearance. The ſecond indication is to relieve all uneaſy ſymptoms, ſuch as heat, thirſt, head-ach, &c.

With reſpect to the opinion entertained by Dr Butter of the cauſe of the puerperal fever, it nearly coincides with that of Mr White. But however plauſible it may appear, we are not entirely ſatisfied that a diſeaſe attended with ſo peculiar ſymptoms as the puerperal fever can depend principally upon an irritability, which is not reſtricted either to the pregnant or puerperal ſtate.

The late Dr Thomas Young profeſſor of midwifery in the univerſity of Edinburgh, although he publiſhed nothing on the ſubject of the puerperal fever, wrote a very ingenious diſſertation reſpecting it, which was read in the Philoſophical Society of Edinburgh. In that diſſertation, after giving a very accurate account of the ſymptoms of the diſeaſe, which coincides very nearly with the account given by others, he endeavours to ſhow, that the *puerperal fever*, ſtrictly ſo called, is in every inſtance the conſequence of contagion; but he contends, that the contagious matter of this diſeaſe is capable only of producing its effect, in conſequence of a peculiar prediſpoſition given by delivery and its conſequences. In ſupport of this doctrine, he remarks, that for many years the diſeaſe was altogether unknown in the lying-in ward of the Royal Infirmary at Edinburgh; but that after it was once accidentally introduced into the hoſpital, almoſt every woman was in a ſhort time after delivery attacked with it; although prior to her delivery, ſhe may have lain even for weeks together, not only in the ſame ward with the infected, but even in the very next bed. He remarks, that it was only eradicated from the hoſpital in conſequence of the wards being entirely emptied, thoroughly ventilated, and new painted. After theſe proceſſes, puerperal females in the hoſpital remained as free from this diſeaſe as formerly. The puerperal fever, according to Dr Young, has very generally a ſtrong tendency to the typhoid type; although he allows, that in

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in the beginning it is not unfrequently attended with inflammatory ſymptoms, and even with topical inflammation, particularly in the inteſtinal canal. On this idea, he conſiders the puerperal fever as admitting of the ſame variety of treatment with other affections depending on contagion, in which ſometimes an inflammatory, ſometimes a putreſcent tendency, prevails; ſuch, for example, as ſmall-pox or eryſipelas. But from the prevailing putreſcent tendency in this affection, he conſiders the free acceſs of cool air, with the liberal uſe of antiſeptics, as being very generally requiſite.

It deſerves to be remarked, that though the ſeveral writers who treat of this ſubject have conducted their method of cure conformably to their particular idea of the cauſe of the diſeaſe, reſpecting which their ſentiment are very different, they ſeem to have been equally ſucceſsful in the treatment of their patients. Indeed the ſeveral writers differ leſs from each other in their method of cure than might be expected, where ſo great an oppoſition of theoretical ſentiments prevails. For after endeavouring to eſtabliſh indications correſpondent to their particular ſyſtems, thoſe who contend for the expediency of promoting the inteſtinal diſcharge, diſſuade not from a recourſe to phlebotomy when the diſeaſe is attended with inflammatory ſymptoms; while, on the other hand, the moſt ſtrenuous advocates for bleeding admit the utility of the former evacuation. It appears, therefore, that a due regulation of the alvine diſcharge is neceſſary through the whole courſe of the fever, but veneſection only ſometimes.

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Head-Ach

The head-ach is ſymptomatic of very many diſtempers, but is rarely an original diſeaſe itſelf. Dr Home acquaints us that his report-books only furniſh four inſtances of it; and of theſe four, three were women. The diſeaſe proved fatal to the man; and after death, a cofiderable effuſion of blood was found on the brain, together with ſome hydatids, and water in the ventricles.

Head-achs appear frequently to be occaſioned by effuſions of blood or ſerum; as well as by ulcers, and abſceſſes of the brain, dura and pia mater. Accretions and oſſifications of different parts of the dura mater, falx, and brain, are alſo frequently diſcovered. An oſſification of the falx, however, does not always produce head-ach: for Dr Home mentions a patient who had the falx oſſified without head-ach; but he had been obſerved to be very furious when drunk. Congeſtions of blood in the veſſels of the brain are alſo diſcovered from diſſections to be a frequent cauſe of the head-ach; and nervous irritation alone will frequently produce it, as we ſee in the *clavus hyſtericus*.

In the cure of this diſeaſe we have little or no power over oſſifications, effuſions, or ulcerations; and hence the head-ach is frequently incurable In congeſtions, and nervous affections, medicines may indeed be of ſome ſervice. Congeſtion may be relieved by an evacuation of blood, either general or topical; as veneſection, cupping, or leeches: by errhines; which, however, Dr Home thinks are little to be depended upon: by topical evacuations near the head by bliſters, iſſues, or ſetons; by purgatives; or by determining the fluids to other parts, by rubefacients applied to the temples, pediluvia, &c.

Cephalalgia.

Nervous irritation may be diminiſhed, 1. By a great quantity of cold water drunk every morning. This is recommended by Hoffman; and will waſh off all acrid particles from the ſtomach, while the cold ſtrengthens and diminiſhes the ſenſibility of the part. This remedy was tried for a conſiderable time in one of Dr Home's patients without any effect. 2. Nervous and tonic medicines; as the bark, valerian, &c Theſe were tried in two of Dr Home's patients, but alſo without ſucceſs. In a third the valerian ſucceeded. 3. By cold water applied to the head, immerſion, or the ſhower-bath. 4. Cephalics; as lavender, roſemary, &c. In ſlight caſes, the ſmell of eau de luce, or any ſtrong volatile alkali, will generally prove a cure.

A *Dangerous* Affection *of the* ŒSOPHAGUS. 406

This diſtemper has only been treated of by Dr Munckley, who reckons it one of the moſt deplorable diſeaſes of the human body. Its beginning is in general ſo ſlight as to be ſcarce worth notice, the patients perceiving only a ſmall impediment to the ſwallowing of ſolid food: they uſually continue in this ſtate for many months; during which, all liquid foods, and even ſolids themſelves, when cut ſmall and ſwallowed leiſurely, are got down without much difficulty: by degrees the evil increaſes, and the paſſage through the œſophagus becomes ſo narrow, that not the ſmalleſt ſolid whatever can paſs through it; but, after having been detained for ſome time at the part where the obſtacle is formed, is returned again with a hollow noiſe of a very peculiar kind, and with the appearance of convulſion.

The ſeat of this malady is ſometimes near the top of the œſophagus, and at other times farther down, nearer the ſuperior orifice of the ſtomach. In this laſt caſe, the part of the alimentary tube which is above the obſtruction is frequently ſo dilated by the food which is detained in it as to be capable of containing a large quantity; and the kind of vomiting, by which it is again returned through the mouth, comes on ſooner or later after the attempt to ſwallow, in proportion to the nearneſs or remoteneſs of the part affected. In the laſt ſtage of this diſeaſe, not even liquids themſelves can be ſwallowed ſo as to paſs into the ſtomach, and the patient dies literally ſtarved to death.

On the diſſection of ſuch as have died in this manner, the œſophagus is found to be conſiderably thickened; and in ſome ſo contracted within at the diſeaſed part, as ſcarcely to admit the paſſing of a common probe; in others, to adhere together in ſuch a manner as entirely to cloſe up the paſſage, and not to be ſeparated without great difficulty.

He comes next to ſhow what he has found to be the moſt efficacious method of treating this diſeaſe, which, though not uncommon, yet in general has been conſidered as incurable.

He claims not the merit of having diſcovered the method of cure, but hopes that ſome ſervice may ariſe from publiſhing what his experience has confirmed to him; having firſt received the hint from another eminent phyſician.

Cephalalgia.

The only medicine, then, from the uſe of which he has ever found any ſervice, is mercury; and in caſes which are recent, and where the ſymptoms have not riſen to any great height, ſmall doſes of mercury given every night, and prevented, by purgative medicines, from affecting the mouth, have accompliſhed the cure.

But where the complaint has been of long ſtanding, and the ſymptom has come on of the food's being returned through the mouth, a more powerful method of treatment becomes neceſſary. In this caſe he has never found any thing of the leaſt avail in removing any of the ſymptoms, but mercury, uſed in ſuch a manner as to raiſe a gentle but conſtant ſpitting: and this method he has purſued with the happieſt ſucceſs. If this method be commenced before the complaint has gained too much ground upon the conſtitution, the caſe is not to be deſpaired of; and of thoſe who have come under his care in this ſtate, by much the greater part have received conſiderable benefit from it, and many have been entirely cured.

The complaint itſelf he obſerves, is not very uncommon; but there is no inſtance, to his knowledge, recorded, of ſucceſs from any other manner of treating it, than that he has recommended.

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WORMS.

Thoſe infeſting the human body are chiefly of three kinds: the *aſcarides*, or ſmall round and ſhort white worms; the *teres*, or round and long worm; and the *tænia*, or tape worm.

The *aſcarides* have uſually their ſeat in the rectum.—The *teretes* or *lumbrici* are about a ſpan long, round and ſmooth: they are ſeated for the moſt part in the upper ſmall inteſtines; but ſometimes they are lodged alſo in the ſtomach, and in any part of the inteſtines, even to the rectum.—The tape worms are from two to forty feet long, according to the teſtimony of Platerus; they generally poſſeſs the whole tract of the inteſtines, but eſpecially the ileum: they very much reſemble a tape in their appearance, whence the name of *tape-worm*: but another ſpecies of this genus, from the reſemblance of each joint to a gourd ſeed, has the name of the *gourd-worm*.

In the Medical Tranſactions, Vol. I. Dr Heberden gives a very accurate account of the ſymptoms produced by the *aſcarides*, from an eminent phyſician who was troubled with them all his life. They brought on an uneaſineſs in the rectum, and an almoſt intolerable itching in the anus; which ſenſations moſt uſually came on in the evening, and prevented ſleep for ſeveral hours. They were attended with heat, ſometimes ſo conſiderable as to produce a ſwelling in the rectum both internally and externally; and if theſe ſymptoms were not ſoon relieved, a teneſmus was brought on, with a mucous dejection. Sometimes there was a griping pain in the lower part of the abdomen, a little above the *os pubis*. If this pain was very ſevere, a bloody mucus followed, in which there was often found aſcarides alive. They were alſo ſometimes ſuſpected of occaſioning diſturbed ſleep, and ſome degree of head-ach.

On this caſe Dr Heberden obſerves, that the general health of the patient did not ſeem to have ſuffered from the long continuance of the diſeaſe, nor the immediate inconveniences of the diſorder itſelf to have increaſed. "It is (ſays he) perhaps univerſally true, that this kind of worms, though as difficult to be cured as any, yet is the leaſt dangerous of all. They have been known to accompany a perſon through the whole of a long life, without any reaſon to ſuſpect that they had haſtened its end. As in this caſe there was no remarkable ſickneſs, indigeſtion, giddineſs, pain of the ſtomach, nor itching of the noſe, poſſibly theſe ſymptoms, where they have happened to be joined with the aſcarides, did not properly belong to them, but aroſe from ſome other cauſes. There is indeed no one ſign of theſe worms, but what in ſome patients will be wanting."

Worms.

The abovementioned patient uſed purging and irritating clyſters with very little ſucceſs. One drachm and an half of tobacco was infuſed in ſix ounces of boiling water; and the ſtrained liquor being given as a clyſter, occaſioned a violent pain in the lower part of the abdomen, with faintneſs and a cold ſweat: this injection, though retained only one minute, acted as a ſmart purge, but did little or no good. Lime-water was alſo uſed as a clyſter; which brought on a coſtiveneſs, but had no good effect. Six grains of ſalt of ſteel were diſſolved in ſix ounces of water, and injected. This clyſter in a few minutes occaſioned an aching in the rectum, griped a little without purging, and excited a teneſmus. Some few aſcarides were brought off with it; but all of them were alive. The uneaſy ſenſation in the rectum did not abate till ſome warm milk was thrown up. Whenever the teneſmus or mucus ſtools were thought worth the taking notice of, warm milk and oil generally gave immediate relief. If purging was neceſſary, the lenient purges, ſuch as manna with oil, were, in this particular caſe, made uſe of: rhubarb was found too ſtimulating.—But, in general, the moſt uſeful purge, and which therefore was moſt uſually taken, was cinnabar and rhubarb, of each half a drachm: this powder ſeldom failed to bring away a mucus as tranſparent as the white of an egg, and in this many aſcarides were moving about. The cinnabar frequently adhered to this mucus, which did not come off in large quantities, when a purge was taken without cinnabar. Calomel did no more than any other purge which operates briſkly would have done; that is, it brought away aſcarides, with a great deal of mucus. Oil given as a clyſter ſometimes brought off theſe animalcules: the oil ſwam on the ſurface of the mucus, and the aſcarides were alive and moving in the mucus itſelf, which probably hindered the oil from coming in contact with them and killing them.

The Doctor alſo obſerves, that mucus or ſlime is the proper neſt of the aſcarides, in which they live, and is perhaps the food by which they are nouriſhed; and it is this mucus which preſerves them unhurt, though ſurrounded with many other liquors, the immediate touch of which would be fatal. It is hard to ſatisfy ourſelves by what inſtinct they find it out in the human body, and by what means they get at it; but it is obſervable in many other parts of nature, as well as here, that where there is a fit ſoil for the hatching and growth of animals and vegetables, nature has taken ſufficient care that their ſeeds ſhould find the way thither. Worms are ſaid to have been found in the inteſtines of infants born dead. Purges, by leſſening this ſlime, never fail to relieve the patient: and it is not unlikely, that the worms which are not forced away by this quickened motion of the inteſtines, may, for want of a proper quantity of it, languiſh, and at laſt die; for if the aſcarides are taken out of their mucus, and expoſed to the open air, they become motionleſs, and apparently die in a very ſhort time. Dr Heberden ſuppoſes that the kind of purge made uſe of is of ſome conſequence in the cure of all other worms as well as aſcarides; the animals being always defended by the mucus from the immediate action of medicines: and that therefore thoſe purges are the beſt which act briſkly, and of which a repetition can be moſt eaſily borne. Purging waters are of this ſort, and jalap eſpecially for children; two or more grains of which, mixed with ſugar, are moſt eaſily taken, and may be repeated daily.

From the caſe above-mentioned, and from Dr Heberden's obſervations, we may eaſily ſee why it is ſo difficult to deſtroy theſe animals; and why anthelmintics, greatly celebrated for ſome cures, are yet ſo far from being ſpecifics in the diſeaſe. As the worms which reſide in the cavities of the human body are never expoſed to the air, by which all living creatures are invigorated, it is evident, that in themſelves they muſt be the moſt tender and eaſily deſtructible creatures imaginable, and much leſs will be requiſite to kill them than any of our common inſects. The moſt pernicious ſubſtances to any of the common inſects are oil, cauſtic fixed alkali, lime, and lime-water. The oil operates upon them by ſhutting up the pores of their bodies; the lime-water, lime, and cauſtic alkali, by diſſolving their very ſubſtance. In the caſe of inteſtinal worms, however, the oil can have very little effect upon them, as they are defended from it by the moiſture and mucus of the inteſtines; the like happens with lime-water: and therefore it is neceſſary that the medicine ſhould be of ſuch a nature as to deſtroy both mucus and inſects together: for which purpoſe the cauſtic fixed alkali is at once ſafe and efficacious; nor is it probable that any caſe of worms whatever could reſiſt the proper uſe of this medicine. A very large doſe of any ſalt indeed will alſo deſtroy the mucus and deſtroy the worms; but it is apt to inflame and excoriate the ſtomach and inteſtines, and thus to produce worſe diſtempers than that which it was intended to cure. Dr Heberden gives the following remarkable caſe of a patient cured of worms by enormous doſes of common ſalt, after trying many other remedies in vain. In February 1757, the patient was ſeized with uncommon pains in his ſtomach, attended with nauſea, vomiting, and conſtipation of bowels, and an almoſt total loſs of ſleep and appetite: He ſoon became much emaciated, and could neither ſtand nor walk upright; his belly grew ſmall and hard, and cloſely retracted, inſomuch that the ſternum covered the navel, and the latter could ſcarce be diſcovered or felt by the finger: his urine was always milky, and ſoon depoſited a thick white ſediment; his excrements were very hard and lumpy, reſembling thoſe of ſheep, only of a brown colour; nor had he ever a ſtool without ſome medicine or other to procure it. In this ſituation he continued four years; during which time he had been in an infirmary, attended by eminent phyſicians, but was diſmiſſed as incurable. At laſt he was adviſed by a neighbour to drink ſalt and water, as he ſaid he knew one cured by it who had for many years been afflicted with the ſame kind of pains in the belly and ſtomach. As his diſtemper was now almoſt inſupportable, he willingly tried the experiment. Two pounds of common ſalt were diſſolved in as little water as poſſible, all which he drank in leſs than an hour. Soon afterwards he found himſelf greatly oppreſſed at the ſtomach, grew extremely ſick, and vomited violently; on the fourth ſtraining he brought up about half a pint of ſmall worms, part aſcarides, and the reſt reſembling thoſe worms which are called the *botts*, and frequently met with in the ſtomach of horſes, but much ſmaller, and about the ſize of a grain of wheat. The ſalt ſoon began to operate downwards, and he had five or ſix very copious fetid ſtools, tinged with blood; and in them diſcharged near an equal quantity of the ſame kind of worms he had vomited. Being greatly fatigued with the violence of the operations, he fell into a calm ſleep, which laſted two hours, during which he ſweated profuſely, and awoke much refreſhed. Inſtead of his uſual pains, he now only complained of a rawneſs and ſoreneſs of his gullet, ſtomach, and bowels, with an almoſt unquenchable thirſt; to allay which, he drank large quantities of cold water, whey, butter-milk, or whatever he could get. The urine he now paſſed was ſmall in quantity, and rendered with very great difficulty, being highly ſaturated with the ſalt, from whence aroſe a moſt troubleſome dyſuria and ſtrangury. However, theſe ſymptoms gradually abated by a free uſe of the liquors abovementioned; and on the third morning he was ſo well recovered, that he took two pounds more of ſalt, diſſolved in the like quantity of water. The effects were nearly ſimilar to the former; only that moſt of the worms were now burſt, and came away with a conſiderable quantity of ſlime and mucus. The drought, ſtrangury, &c. returned with their former violence, but ſoon yielded to the old treatment. He ſweated very copiouſly for three days, ſlept eaſily, and by that time could extend his body freely: on the fifth day he left his bed, and, though very weak, could walk upright; his ſtrength and appetite ſoon returned, and he became robuſt and well.

The anthelmintic medicines which have been recommended by one perſon or other, are in a manner innumerable; but the principal are,

1. *Quickſilver.* This is very efficacious againſt all kinds of worms, either taken in the form of calomel or corroſive ſublimate. Even the crude metal boiled in water and the water drunk, has been recommended as an almoſt certain cure. But this, it is evident, can receive no impregnation from the mercury. If, therefore, it have any effect, it muſt be from ſome foreign and accidental impregnation. In moſt inſtances there can be no objection to mercury, but only that it is not endowed with any attenuating quality whereby the mucus in which theſe inſects reſide can be diſſolved. It therefore fails in many caſes, though it will moſt certainly deſtroy worms where it can get at them.

2. *Powder of tin.* This was for ſome time celebrated as a ſpecific, and indeed we may reaſonably expect good effects from it; as by its weight and

grittineſs it rubs off the mucus and worms it contains from the coats of the inteſtinal canal, in which caſe they are eaſily evacuated by purgatives. In order to produce any conſiderable effects, it muſt be given in a large doſe.

3. *Geoffræa-inermis, or cabbage bark.* This remedy is uſed by the inhabitants of Jamaica. The firſt account of it which appeared in Britain was publiſhed in the Phyſical and Literary Eſſays, vol. ii. by Mr Duguid ſurgeon in that iſland. He acquaints us, that the inhabitants of Jamaica, young and old, white and black, are much infeſted with worms, eſpecially the long round ſort; the reaſon of which, he thinks, is the quantity of ſweet viſcid vegetables which they eat. On diſſecting a child of ſeven months old, who died of vomiting and convulſions, twelve large worms were found; one of them filled the *appendix vermiformis*, and three of them were intwiſted in ſuch a manner as to block up the *valvula Tulpii*, ſo that nothing could paſs from the ſmall to the great guts.—The cabbage-bark, however, he tells us, is a ſafe and effectual remedy, and the moſt powerful vermifuge yet known; and that it frequently brings away as many worms by ſtool as would fill a large hat. He owns that it has ſometimes violent effects; but this he aſcribes to the negroes who make the decoction (in which form the bark is uſed), and not to the remedy itſelf.

Mr Anderſon, ſurgeon in Edinburgh, has alſo given an account of this bark and its operation, in a letter to Dr Duncan, publiſhed in the Edinburgh Medical Commentaries, volume iv. p. 84. From this account it appears, that there are two different kinds of bark; the one much paler than the other: the pale kind operates much more violently than the other. It often occaſions looſe ſtools, great nauſea, and ſuch like ſymptoms, attended with great uneaſineſs in the belly: in one or two inſtances it was ſuſpected of inducing ſyncope. The darker coloured kind reſembles the caſſia lignea, though it is of a much coarſer texture. This kind, Mr Anderſon thinks, may be exhibited in any caſe where an anthelmintic is neceſſary; the dangerous ſymptoms might have followed either from the uſe of the firſt kind, or from an over-doſe of the ſecond. The uſual method of preparing the medicine is by boiling two ounces and a half of the bark in two quarts of water to a pint and a half. Of this a tea-ſpoonful may be given at firſt in the morning, gradually increaſing the quantity till we come to four or five table ſpoonfuls in a day. When exhibited in this manner, Mr Anderſon informs us, that he never ſaw it produce any violent ſymptoms, and has experienced the beſt effects from it as an anthelmintic. After the uſe of this decoction for eight or nine mornings ſucceſſively, a doſe of jalap with calomel muſt be given, which ſeldom fails to bring away the worms, ſome dead, ſome alive. If at any time the decoction produce more than one or two looſe ſtools, a few drops of liquid laudanum may be given; and, in general, Mr Anderſon gave 15 or 20 drops of the ſpirit of lavender with each doſe.

In a letter from Dr Ruſh, profeſſor of chemiſtry at Philadelphia, to Dr Duncan of Edinburgh, the following account is given of another preparation of this medicine. "It has long (ſays he) been a complaint among phyſicians, that we have no *vermifuge* medicine which can be depended upon. Even calomel fails in many caſes where there are the moſt pathognomonic ſigns of worms in the bowels. But this complaint, it is hoped, is now at an end. The phyſicians of Jamaica have lately found, that the *cabbage-bark*, as it is called in the Weſt Indies, made into a ſyrup with brown ſugar, is an infallible antidote to them. I have uſed above 30 pounds of it, and have never found it fail in one inſtance. The ſyrup is pleaſant; it ſometimes pukes, and always purges, the firſt or ſecond time it is given."

Notwithſtanding theſe encomiums, however, the cabbage-bark (A) hath not come into general uſe in Britain. But diſeaſes from the *teretes*, or *lumbrici* as they are often called, the ſpecies of worm againſt which this bark is employed, much leſs frequently occur than in ſome other countries. When they do occur, in almoſt every inſtance they readily yield to more gentle and ſafe anthelmintics; and the worms may not only be expelled by calomel, but by the vegetable bitters; as the powder of the ſemen ſantonicum, or the like.

4. *Couhage*, or *cow-itch*. This is the *Dolichos urens* or *pruriens* of Linnæus; and the principles on which it acts have been already explained under the article Dolichos. It is ſomewhat ſimilar to the powder of tin, but bids fair for being more efficacious. It might at firſt appear to occur as objections to this medicine, that by the hairs of it entangling themſelves with one another, calculi might be formed in the inteſtines, or obſtructions equally bad; or if the ſharp points and hooks with which it abounds were to adhere to the nervous coats of the inteſtines themſelves, they might occaſion a fatal irritation, which could not be removed by any means whatever. But from the experience of thoſe who have employed it extenſively in practice, it would appear, that theſe objections are entirely theoretical; and that it may be employed with perfect ſafety. The ſpiculæ, gently ſcraped off from a ſingle pod, and mixed with ſyrup or melaſſes, are taken for a doſe in the morning faſting. It is repeated in this manner for two or three days without any ſenſible operation; but even a very ſlight purgative taken afterwards has been found to diſcharge an almoſt incredible quantity of worms. And according to Dr Bancroft, who has given a very particular account of its uſe in his Natural Hiſtory of Guaiana, it is one of the ſafeſt and moſt certain anthelmintics yet diſcovered; but, as well as the bark of the *Geoffræa*, it has hitherto been very little uſed in Britain, probably from its not being neceſſary.

5. *Indian pink.* The plant, which in the *Spigelia*

marilandica

(A) The moſt accurate account of this vegetable, and its effects, has been given by Dr Wright in the Philoſophical Tranſactions, of which the reader will find a ſhort view under the article *Geoffræa*, in the order of the alphabet.

marilandica and Linnæus, is alſo an American plant, and was firſt recommended in the Edinburgh Phyſical and Literary Eſſays by Dr Garden of Charleſtown in South Carolina. He is of opinion that a vomit ought always to precede the uſe of it; and informs us, that half a drachm of it purges as briſkly as the ſame quantity of rhubarb. At other times he has known it produce no effect on the belly though given in very large quantity: In ſuch caſes it becomes neceſſary to add a grain or two of ſweet mercury, or ſome grains of rhubarb; but then it is leſs efficacious than when it proves purgative without addition. The uſe of it, however, in ſmall doſes, is by no means ſafe; as it frequently produces giddineſs, dimneſs of ſight, convulſions, &c. The addition of a purgative, indeed, prevents theſe effects; but at the ſame time, as already obſerved, it diminiſhes the virtue of the medicine. The Doctor therefore recommends large doſes, as from them he never knew any other effect than the medicine's proving emetic or violently cathartic. The doſe is from 12 to 60 or 70 grains of the root in ſubſtance, or two, three, or four drachms of the infuſion, twice a-day.

This medicine has alſo had its day, and is now very far from being conſidered as a ſpecific. From what has been already obſerved, it muſt pretty clearly appear, that powder of tin, cow-itch, or fixed alkaline ſalts, bid faireſt for deſtroying worms in all the variety of caſes in which they can occur. Alkalies indeed have been but little tried. We have known one caſe in which all the complaints have been removed by a ſingle doſe: we have alſo an inſtance of their efficacy, in an extraordinary caſe of a worm bred in the liver, mentioned in the 2d volume of the Medical Obſervations. The patient had a violent pain in the ſide, and ſometimes in the ſhoulder, as the worm ſhifted its place; but, on the application of a lixivial poultice, the pain went out of the ſide entirely, and kept in the ſhoulder for ſome weeks.

The long round worms ſeem to be the moſt dangerous which infeſt the human body, as they often pierce through the ſtomach and inteſtines, and thus bring on a miſerable death. The common ſymptoms of them are nauſea, vomiting, looſeneſs, fainting, ſlender intermitting pulſe, itching of the noſe, and epileptic fits. By the conſumption of the chyle they produce hunger, paleneſs, weakneſs, coſtiveneſs, tumor of the abdomen, eructations, and rumbling of the inteſtines; but it is from the perforation of the inteſtines that the diſeaſe proves ſo frequently fatal. A child may be known to have worms from his cold temperament, paleneſs of the countenance, livid eye-lids, hollow eyes, itching of the noſe, voracity, ſtartings, and grinding of the teeth in ſleep; and more eſpecially by a very fetid breath. Very frequently, however, they are voided by the mouth and anus, in which caſe there is no room for doubt. In the Medical Commentaries, vol. II. we have an account of the inteſtines being perforated by a worm, and yet the patient recovered. The patient was a woman troubled with an inflammation in the lower part of the abdomen. The pain was ſo violent, that for ſix days ſhe ſlept none at all; the tumor then broke, diſcharged upwards of a pound of thin watery ſanies, immediately after which the excrements followed. The next day ſhe was extremely low; her pulſe could ſcarcely be felt; the extremities were cold; and there was a conſiderable diſcharge from the wound, which had already begun to mortify. She got a decoction of the bark with wine, which alleviated the ſymptoms; but in removing the mortified parts a worm was found among them nine inches long, and as thick as an eagle's quill. By proper applications, the diſcharge of excrements ceaſed, and ſhe recovered perfect health. She was ſenſible of no accident giving riſe to the inflammation; ſo that in all probability it aroſe entirely from the worm itſelf.

The *tænia*, or *tape-worm*, as it is called, is one of thoſe moſt difficult to be removed from the human body. It is of two kinds, *tænia ſolium* and *tænia lata*; for a deſcription of which ſee the article TÆNIA.—The reaſon of its being ſo difficult to cure, is, that though portions of it are apt to break off and be diſcharged, it is endowed with a power of reproduction, ſo that the patient is little or nothing better. The ſymptoms occaſioned by it are not different from thoſe above deſcribed. A ſpecific againſt the *tænia lata* hath been lately ſo much celebrated in France, that the king thought proper to purchaſe it from the proprietor (Madam Nouffer), and the account of it has been tranſlated into Engliſh by Dr Simmons. The patients are required to obſerve no particular regimen till the day before they take the ſpecific. That day they are to take nothing after dinner till about 7 o'clock; after which, they are to take the following ſoup: "Take a pint and an half of water, two or three ounces of good freſh-butter, and two ounces of bread cut into thin ſlices: add to this ſalt enough to ſeaſon it, and then boil it to the conſiſtence of panada." About a quarter of an hour after this, they take a biſcuit and a glaſs of white-wine, either pure or mixed with water; or even water alone, if they have not been accuſtomed to wine. If the patient has not been to ſtool that day, (which, however, is not uſual with patients in this way), the following clyſter is to be injected. "Take a ſmall quantity of the leaves of mallows, and boil them in a ſufficient quantity of water, mixing with it a little ſalt, and when ſtrained off add two ounces of oil olive." Next morning, about eight or nine hours after the ſupper abovementioned, the ſpecific is to be taken. This is no other than two or three drachms of the root of male fern, *polypodium filix mas* of Linnæus, gathered in autumn, and reduced to fine powder. It is to be taken in any diſtilled water, or in common water. This medicine is apt to occaſion a nauſea: to avoid which, Madam Nouffer allows her patients to chew any thing that is agreeable, but forbids any thing to be ſwallowed; or they may ſmell to vinegar, to check the ſickneſs: but if, notwithſtanding this, the ſpecific be thrown up, a freſh doſe muſt be ſwallowed as ſoon as the ſickneſs is gone off, and then they muſt try to ſleep. About two hours after this the following bolus is to be taken. "Take of the panacea of mercury 14 times ſublimed, and ſelect reſin of ſcammony, each ten grains; of freſh and good gamboge, ſix or ſeven grains: reduce each of theſe ſubſtances ſeparately into powder, and then mix them with ſome conſerve into a bolus." This compoſition is to be ſwallowed at two different times, waſhing it down with one or two diſhes of weak green-tea, after which the patient muſt walk about his chamber. When the bolus begins to operate, he is to take a diſh of the ſame tea occaſionally, until the worm be expelled; then, and not before, Madame Nouffer gives him broth or ſoup, and he is directed to dine as is uſual after taking phyſic. After dinner he may either lye down or walk out, taking care to conduct himſelf diſcreetly, to eat but little ſupper, and to avoid every thing that is not of eaſy digeſtion.

The cure then is complete; but it is not always effected with the ſame quickneſs in every ſubject. He who has not kept down the whole bolus, or who is not ſufficiently purged by it, ought to take, four hours after it, from two to eight drachms of Epſom ſalt diſſolved in boiling water. The doſe of this ſalt may be varied according to the temperament and other circumſtances of the patient.

If the worm ſhould not come away in a bundle, but in the form of a thread (which particularly happens when the worm is involved in much tenacious mucus), the patient muſt continue to ſit upon the cloſe ſtool without attempting to draw it away, drinking at the ſame time warm weak tea: ſometimes this alone is not ſufficient, and the patient is obliged to take another doſe of purging ſalt, but without varying his poſition till the worm be wholly expelled.

It is unuſual for patients who have kept down both the ſpecific and purging doſe, not to diſcharge the worm before dinner-time. This, however, ſometimes happens when the dead worm remains in large bundles in the inteſtines, ſo that the fæces becoming more limpid towards the end of the purging, paſs by it without drawing it with them. The patient may in this caſe eat his dinner; and it has been obſerved, that the food, joined to the uſe of a clyſter, has brought about the expulſion of the worm.

Sometimes the worm is brought away by the action of the ſpecific alone, before the patient has taken the purging bolus: when this happens, Madame Nouffer gives only two-thirds of it, or ſubſtitutes the ſalt in its ſtead.

Patients muſt not be alarmed by any ſenſation of heat or uneaſineſs they may feel during the action of the remedy, either before or after a copious evacuation, or juſt as they are about to void the worm. Theſe ſenſations are tranſitory, and go off of their own accord, or by the aſſiſtance of the vapour of vinegar drawn in at the noſe.

They who have vomited both the ſpecific and bolus, or who have kept down only a part of them, ſometimes do not void the worm that day. Madame Nouffer therefore directs them to take again that night the ſoup, the wine and biſcuit; and if circumſtances require it, the clyſter. If the worm do not come away during the night; ſhe gives them early the next morning another doſe of the ſpecific, and, two hours afterwards, ſix drachms or an ounce of purging ſalt, repeating the whole proceſs of the preceding day; excepting the bolus, which ſhe ſuppreſſes.

She obſerves, that very hot weather diminiſhes in ſome degree the action of her remedy; ſhe therefore prefers the month of September for adminiſtering it; but as ſhe has not been always able to chooſe the ſeaſon, and has been ſometimes obliged to undertake the cure of patients in the hotteſt days of ſummer, ſhe then gave her ſpecific very early in the morning; and with this precaution ſhe ſaw no difference in its effects.

On the day appointed for the trial of this medicine before the commiſſioners nominated by the king of France, it was exhibited to five different perſons; but only one of them was certainly known to have the *tænia lata* by having diſcharged parts of it before. That perſon was cured; the ſecond voided a portion of the *tænia ſolium*; the third ſome *aſcarides*, with a part of the *tænia ſolium*; the fourth and fifth voided no worms; but the laſt conſidered much of the viſcid ſlime he voided to be worms in a diſſolved ſtate.

This trial was thought ſufficient to aſcertain the efficacy of the medicine, and further trials were made by thoſe to whom the ſecret was communicated. The firſt voided two tænia, after much vomiting and 18 or 20 ſtools; the ſecond had no vomiting, but was as violently purged, and diſcharged two worms; the third had 20 copious ſtools during the night, and diſchaged the worm in the morning; and the fifth was effected in much the ſame manner. Some others who were not relieved, were ſuppoſed not to have a tænia.

This ſpecific, however, is not to be conſidered as a new diſcovery; the efficacy of fern in caſes of tenia having been known long ago. Theophraſtus preſcribes its root, in doſes of four drams, given in water ſweetened with honey, as uſeful in expelling flat worms.—Dioſcorides orders it in the ſame doſe, and adds, that its effects are more certain when it is mixed with four oboli (40 grains) of ſcammony or black hellebore; he particularly requires that garlic ſhould be taken before hand. Pliny, Galen, Oribaſius, and Aëtius, aſcribe this ſame virtue to fern; and are followed in this by Avicenna, and the other Arabian, phyſicians. Dorſtenius, Valerias Cordus, Dodonæus, Mathiolus, Dalechampius, who commented on Dioſcorides, or copied him in many things, all mention the fern-root as a ſpecific againſt the tænia. Sennertus, and Burnet after him, recommended in ſimilar caſes an infuſion of this plant, or a dram of its powder for young perſons, and three drams for adults, Simon Paulus, quoted by Ray and Geoffroy, conſiders it as the moſt efficacious of all poiſons againſt the flat worm, and as being the baſis of all the ſecret remedies extolled by emperics in that diſeaſe. Andry (*génér. des Vers, p.* 246, 249) prefers diſtilled fern-water to the root in powder, or he employs it only in the form of an opiate, or mixed with other ſubſtances.

Theſe are not the only authors who have mentioned the tænia; many others have deſcribed this worm, the ſymptoms it excites, and the treatment proper to expel it. Almoſt all of them mention the fern-root, but at the ſame time they point out other remedies as poſſeſſing equal efficacy. Amongſt theſe we find the bark of the root of the mulberry tree, the juice of the *auricula murus*, the roots of *chamælion niger*, ginger, zedoary; decoctions of mugwort, ſouthernwood, wormwood, penny-royal, origanum, hyſſop, and in general of all bitter and aromatic plants, &c. Some of them direct the ſpecific to be ſimply mixed and taken in wine or honey and water; others join to it the uſe of ſome purgative remedy, which they ſay adds to its efficacy. Oribaſius, Sylvius, &c. diſtinguiſh the ſpecific that kills the worm, from the purgative that evacuates it, and direct them to be given at different times. Sennertus gives a very ſatisfactory reaſon for adopting this method. If we give, ſays he, the purgative medicine and the ſpecific at the ſame time, the latter will be haſtily carried off before it can have exerted its powers on the worm: whereas, if we give the ſpecific firſt, and thus weaken the worm, it will collect itſelf into a bundle, and being brought away by means of the purge, the patient will be cured. The cure will be more ſpeedy if the *primæ viæ* have been previouſly lubricated. Theſe precautions are all of them eſſential to the ſucceſs of the remedy, nor are they neglected by Madame Nouffer in her method of treatment. The panada and injection ſhe preſcribes the night before, to lubricate the inteſtines, and prepare the *primæ viæ*. The fern-root, taken in the morning, kills and detaches the worm: of this the patients are ſenſible by the ceſſation of the pain in the ſtomach, and by the weight that is felt in the lower belly. The purgative bolus adminiſtered two hours after this, procures a complete evacuation; it is compoſed of ſubſtances that are at once purgative and vermifuge, and which, even when adminiſtered alone, by different phyſicians, ſometimes ſucceeded in expelling the worm. If this purgative appear to be too ſtrong, the reader is deſired to recollect, that it produced no ill effects in either of the caſes that came under the obſervation of the phyſicians appointed to make the trials, and that in one of thoſe caſes, by diminiſhing the doſe, they evidently retarded the evacuations.— Regard however, they obſerve, is to be had both to the age and the temperament of the patient, and the treatment ſhould always be directed by a prudent and experienced phyſician, who may know how to vary the proportions of the doſe as circumſtances may require. If the purgative be not of ſufficient ſtrength, the worm, after being detached by the ſpecific, remains too long a time in the inteſtines, and becoming ſoon corrupted is brought away only in detached portions: on the other hand, if the purgative be too ſtrong, it occaſions too much irritation, and evacuations that cannot fail to be inconvenient.

Madame Nouffer's long experience has taught her to diſtinguiſh all theſe circumſtances with ſingular adroitneſs.

This method of cure is, as we have ſeen, copied in a great meaſure from the ancients: it may be poſſible to produce the ſame effects by varying the remedies; but the manner of applying them is by no means indifferent: we ſhall be always more certain of ſucceſs, if the inteſtines be previouſly evacuated, and if the ſpecific be given ſome time before the purgative bolus. It is to this method that Madame Nouffer's conſtant ſucceſs is attributed.

Her remedy has likewiſe ſome power over the *tænia ſolium;* but as the rings of this worm ſeparate from each other more eaſily than thoſe of the *tænia lata*, it is almoſt impoſſible for it to be expelled entire. It will be neceſſary therefore to repeat the treatment ſeveral times, till the patient ceaſe to void any portions of worms. It muſt likewiſe be repeated, if, after the expulſion of one *tænia ſolium*, another ſhould be generated in the inteſtinal canal. This laſt caſe is ſo rare, that it has been ſuppoſed that no perſon can have more than one of theſe worms; and for this reaſon it has been named *ſolitary worm*, which, being once removed, could never be renewed or replaced by a ſecond: but experience has proved, that this notion is an ill-founded prejudice, and we know that ſometimes theſe worms ſucceed each other, and that ſometimes many of them exiſt together. Two living tæniæ have frequently been expelled from the ſame patient. Dr De Haen (*Rat. Med.* tom. viii. p. 157.) relates an inſtance of a woman who voided 18 tæniæ at once. In theſe caſes the ſymptoms are uſually more alarming; and the appetite becomes exceſſive, becauſe theſe worms derive all their nouriſhment from the chyle. If too auſtere and ill judged a regimen deprives them of this, they may be expected to attack even the membranes of the inteſtines themſelves. This evil is to be avoided by eating frequently.

Such are the precautions indicated in this diſeaſe. The ordinary vermifuge remedies commonly procured only a palliative cure, perhaps becauſe they were too often improperly adminiſtered. But the efficacy of the preſent remedy, in the opinion of the French phyſicians, ſeems to be ſufficiently confirmed by experience. To the above account, however, it ſeems proper to ſubjoin the following obſervations by Dr Simmons.

"A Swiſs phyſician, of the name of *Herrenſchwand*, more than 20 years ago, acquired no little celebrity by diſtributing a compoſition of which he ſtyled himſelf the *inventor*, and which was probably of the ſame nature as Madame Nouffer's. Several very eminent men, as Tronchin, Hovius, Bonnet, Crammer, and others, have written concerning the effects of this remedy. It ſeems that Dr Herrenſchwand uſed to give a powder by way of preparation, the night before he adminiſtered his ſpecific. Nothing could be ſaid with certainty concerning the compoſition either of one or the other. The treatment was ſaid ſometimes to produce moſt violent effects, and to leave the patients in a valetudinary ſtate. Dr De Haen was diſſuaded by his friends from uſing it, becauſe it diſordered the patients too much. It will be readily conceived, now that we are acquainted with Madame Nouffer's method that theſe effects were occaſioned wholly by the purgative bolus. It is not ſtrange, that reſin of ſcammony or jalap, combined with *mercurius dulcis* and gamboge, all of them in ſtrong doſes, ſhould in many ſubjects occaſion the greateſt diſorders. It ſeems likely, however, that much of the ſucceſs of the remedy depends on the uſe of a draſtic purge. Some of the ancients who were acquainted with the virtues of the fern-root, obſerved that its efficacy was increaſed by ſcammony. Reſinous purges eſpecially when combined with mercury, have often been given with ſucceſs in caſes of *tænia*. Dr De Haen ſaw a worm of this ſort five ells long expelled by the reſin of jalap alone. Dr Gaubius knew a woman who had taken a variety of anthelmintic remedies without any effect, though ſhe had voided a portion of *tænia* an ell and an half long previous to the uſe of theſe medicines: but at length, after taking a purge of ſingular ſtrength, ſhe voided the worm entire. Many other inſtances of the ſame kind are to be met with in authors. Other remedies have occaſionally been given with ſucceſs. In Sweden, it has been a practice to drink ſeveral gallons of cold water, and then to take ſome draſtic purge. Boerhaave ſays, that he himſelf ſaw a *tænia* meaſuring 300 ells expelled from a Ruſſian by means of the *vitriolum martis*. All theſe methods, however have been too often ineffectual."

From ſome late accounts, there is reaſon to believe that Dr Herrenſchwand's remedy for *tænia* does not ſo exactly agree with that of Madame Nouffer as Dr Simmons ſeems to imagine. According to the account given us by a gentleman who had his information from Dr Herrenſchwand himſelf, it conſiſts entirely of gamboge and fixed vegetable alkali.

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Of POISONS.

These have all been treated of already, except the bites and ſtings of ſerpents, ſcorpions, &c. According to Dr Mead, the ſymptoms which follow the bite of a viper are, an acute pain in the place wounded, with a ſwelling, at firſt red, but afterwards livid, which by degrees ſpreads farther to the neighbouring parts; with great faintneſs, and a quick, low, and ſometimes interrupted pulſe; great ſickneſs at ſtomach, with bilious convulſive vomitings, cold ſweats, and ſometimes pains about the navel. Frequently a ſanious liquor runs from the ſmall wound, and little puſtules are raiſed about it: the colour of the whole ſkin in leſs than an hour is changed yellow, as if the patient had the jaundice. Theſe ſymptoms are very frequently followed by death, eſpecially if the climate be hot, and the animal of a large ſize. This is not, however, the caſe with all kinds of ſerpents. Some, we are aſſured, kill by a fatal ſleep; others are ſaid to produce an univerſal hemorrhagy and diſſolution of the blood; and others an unquenchable thirſt. But of all the ſpecies of ſerpents hitherto known, there is none whoſe bite is more expeditiouſly fatal than that of the rattle-ſnake. Dr Mead tells us, that the bite of a large ſerpent of this kind killed a dog in a quarter of a minute; and to the human ſpecies they are almoſt equally fatal. Of this ſerpent it is ſaid, that the bite makes the perſon's ſkin become ſpotted all over like the ſkin of the ſerpent; and that it has ſuch a motion as if there were innumerable living ſerpents below it. But this is probably nothing more than a diſſolution of the blood, by which the ſkin becomes ſpotted as in petechial fevers, at the ſame time that the muſcles may be convulſed as in the diſtemper called *hieranoſos*, which was formerly thought to be the effect of evil ſpirits: but it is even not improbable that obſervers have been ſomewhat aided by fancy and ſuperſtition when they thought that they detected ſuch appearances.

It has juſtly appeared ſurpriſing to philoſophers, how ſuch an inconſiderable quantity of matter as the poiſon emitted by a viper at the time of biting ſhould produce ſuch violent effects. But all inquiries into this matter muſt neceſſarily be uncertain; neither can they contribute any thing towards the cure. It is certain that the poiſon produces a gangrænous diſpoſition of the part itſelf, and likewiſe ſeemingly of the reſt of the body; and that the original quantity of poiſon continues ſome time before it exerts all its power on the patient, as it is known that removing part of the poiſonous matter by ſuction will alleviate the ſymptoms. The indications of cure then are three, 1. To remove the poiſonous matter from the body: Or, 2. If this cannot be done, to change its deſtructive nature by ſome powerful and penetrating application to the wound: And, 3. To counteract the effects of that portion already received into the ſyſtem.

The poiſonous matter can only be removed from the body by ſucking the wound either by the mouth, or by means of a cupping-glaſs; but the former is probably the more efficacious, as the ſaliva will in ſome meaſure dilute and perhaps obtund the poiſon. Mead directs the perſon who ſucks the wound to hold warm oil in his mouth, to prevent inflammation of the lips and tongue: but as bites of this kind are moſt likely to happen in the fields, and at a diſtance from houſes, the want of oil ought by no means ought to retard the operation, as the delay of a few minutes might prove of the moſt fatal conſequence; and it appears from Dr Mead's experiments, that the taking the poiſon of a viper into the mouth undiluted, is attended with no worſe conſequences than that of raiſing a ſlight inflammation. A quick exciſion of the part might alſo be of very great ſervice.

The only way of anſwering the ſecond indication is, by deſtroying the poiſoned part by a red-hot iron, or the application of alkaline ſalts, which have the power of immediately altering the texture of all animal-ſubſtances to which they are applied, provided they are not covered by the ſkin; and as long as the poiſon is not totally abſorbed into the ſyſtem, theſe muſt certainly be of uſe.

To anſwer the third indication, Dr Mead recommends a vomit of ipecacuanha, encouraged in the working with oil and warm water. The good effects of this, he ſays, are owing to the ſhake which it gives to the nerves, whereby the irregular ſpaſms into which their whole ſyſtem might be drawn are prevented. After this the patient muſt go to bed, and a ſweat muſt be procured by cordial medicines; by which the remaining effects of the poiſon will be carried off.

It has been confidently aſſerted by many, that the American Indians are poſſeſſed of ſome ſpecific remedy by which they can eaſily cure the bite of a rattle-ſnake. But Mr Cateſby, who muſt have had many opportunities of knowing this, poſitively denies that they have any ſuch medicine. They make applications indeed, and ſometimes the patient recovers; but theſe recoveries he aſcribes to the ſtrength of nature overcoming the poiſon, more than to the remedies made uſe of. He ſays, they are very acute in their prognoſtics whether a perſon that is bit will die or not; and when they happen to receive a bite in certain parts of the body, when the teeth of the animal enter a large vein, for inſtance, they quietly reſign themſelves to their fate, without attempting any thing for their own relief. Indeed, ſo violent and quick is the operation of this poiſon, that unleſs the antidote be inſtantly applied, the perſon will die before he can get to a houſe. It would ſeem therefore eligible for thoſe who are in danger of ſuch bites, to carry along with them ſome ſtrong alkaline ley, or dry alkaline ſalt, or both, which could be inſtantly clapt on the wound, and by its diſſolving power would deſtroy both the poiſon and the infected parts. Strong cordials alſo, ſuch as ardent ſpirits, volatile alkali, &c. might poſſibly excite the languid powers of nature, and enable her to expel the enemy, which would otherwiſe prove too powerful. This ſeems to be ſomewhat confirmed from the account we have in the Philoſophical Tranſactions of a gentleman bit by a rattle-ſnake, who was more relieved by a poultice of vinegar and vine-aſhes put to his wound than any thing elſe. The vine-aſhes being of an alkaline nature, muſt have ſaturated the vinegar, ſo that no part of the cure could be attributed to it: on the other hand, the aſhes themſelves could not have been ſaturated by the ſmall quantity of acid neceſſary to form them into a poultice; of conſequence they muſt have operated by their alkaline quality.—Soap-ley, therefore, or very ſtrong ſalt of tartar, may reaſonably be thought to be the beſt external application, not only for the bites of vipers, but of every venomous creature; and in fact we find *dry ſalt* univerſally recommended both in the bites of ſerpents and of mad dogs. Dr Mead recommends the fat of vipers preſently rubbed into the wound; but owns that it is not ſafe to truſt to this remedy alone.

Some years ago the volatile alkali was ſtrongly recommended by M. Sage of the French academy, as a powerful remedy againſt the bite of the viper: and, by a letter from a gentleman in Bengal to Dr Wright, it would appear that this article, under the form of the *eau de luce*, which is very little if any thing different from the *ſpiritus ammoniæ ſuccinatus* of the London Pharmacopoeia, has been employed with very great ſucceſs againſt this affection in the Eaſt Indies: but from the trials made with it by the Abbé Fontana, publiſhed in his Treatiſe on the poiſon of the Viper, it would appear that it by no means anſwered his expectation: and the efficacy of this, as well as of the ſnake pills mentioned under the article Hydrophobia, ſtill requires to be confirmed by further experience.

409 MELÆNE.

This is a diſtemper not very common, but it has been obſerved by the ancient phyſicians, and is deſcribed by Hippocrates under the name of *morbus niger*. It ſhows itſelf by a vomiting and purging of black tar-like matter; which Hippocrates, Boerhaave, and Van Swieten, ſuppoſed to be occaſioned by atra bilis. But Dr Home, in his Clinical Experiments, ſhows that it is owing to an effuſion of blood from the meſeraic veſſels, which by its ſtagnation and corruption aſſumes that ſtrange appearance. The diſeaſe, he ſays, frequently follows hæmorrhagy; and thoſe of a ſcorbutic habit are moſt ſubject to it. It is an acute diſeaſe, and terminates ſoon; yet is not attended with any great degree of fever. In one of Dr Home's patients the criſis happened on the eighth day by diarrhœa; in another, on the 14th, by ſweat and urine; and a third had no evident critical evacuation.

As to the cure, Dr Home obſerves, that bleeding is always neceſſary where the pulſe can bear it; nor are we to be deterred from it by a little weakneſs of the pulſe, more than in the interitis. Emetics are hurtful, but purgatives are uſeful. But the moſt powerful medicine for checking this hæmorrhagy is the vitriolic acid: and, that this might be given in greater quantity, he mixed it with mucilage of gum arabic; by which means he was enabled to give double the quantity he could otherwiſe have done. The cold bath was tried in one inſtance, but he could not determine whether it was of any ſervice or not. The cure was completed by exerciſe and the bark.

Of the DISEASES *of* CHILDREN. 410

Dr Buchan obſerves, that from the annual regiſters of the dead it appears, that about one half of the children born in Great Britain die under twelve years of age; and this very great mortality he attributes in a great meaſure to wrong management. The particulars of this wrong management enumerated by him are,

1. Mothers not ſuckling their own children. This, he owns, it is ſometimes impoſſible for them to do; but where it can be done, he affirms that it ought never to be omitted. This, he ſays, would prevent the unnatural cuſtom of mothers leaving their own children to ſuckle thoſe of others; on which he paſſes a moſt ſevere cenſure, and indeed ſcarce any cenſure can be ſevere enough upon ſuch inhumanity. Dr Buchan informs us, "He is ſure he ſpeaks within bounds, when he ſays not one in an hundred of theſe children live who are thus abandoned by their mothers." For this reaſon he adds, that no mother ſhould be allowed to ſuckle another's child till her own be fit to be weaned. A regulation of this kind would ſave many lives among the poorer ſort, and would do no harm to the rich; as moſt women who make good nurſes are able to ſuckle two children in ſucceſſion upon the ſame milk.

2. Another ſource of the diſeaſes of children is the unhealthineſs of parents: and our author inſiſts that no perſon who labours under an incurable malady ought to marry.

3. The manner of cloathing children tends to produce diſeaſes. All that is neceſſary here, he ſays, is to wrap the child in a ſoft looſe covering; and the ſoftneſs of every part of the infant's body ſufficiently ſhows the injury which muſt neceſſarily enſue by purſuing a contrary method.

4. A new-born infant, inſtead of being treated with ſyrups, oils, &c. ought to be allowed to ſuck the mother's milk almoſt as ſoon as it comes into the world. He condemns the practice of giving wines and ſpirituous liquors along with the food ſoon after birth; and ſays, that if the mother or nurſe has a ſufficient quantity of milk, the child will need little or no other food before the third or fourth month. But to this it may reaſonably be objected, not only that the nurſing would thus be very ſevere on the mother; but if the child be left thus long without food, it will not eaſily reliſh it for ſome time, and its ſtomach is apt to be eaſily hurt by a ſlight change of diet after it has been long accuſtomed to one thing. Neither can it be ſhown, that the ſtrongeſt and moſt healthy infants are thoſe which get no other food but the mother's milk during the firſt months of their life. In fact, children are evidently of a weak and lax habit of body, ſo that many of their diſeaſes muſt ariſe from that cauſe; all directions which indiſcriminately adviſe an antiphlogiſtic regimen for infants as ſoon as they come into the world, muſt of neceſſity be wrong. Many inſtances in fact might be brought to ſhow, that by the prepoſterous method of ſtarving infants, and at the ſame time treating them with vomits and purges, they are

often hurried out of the world. Animal-food indeed is exceſſively agreeable to children, and they ought to be indulged with it in moderation; and this will prove a much better remedy for thoſe acidities with which children are often troubled, than magneſia alba, crab's eyes, or other abſorbents, which have the moſt pernicious effects on the ſtomachs of theſe tender creatures, and pall the appetite to a ſurpriſing degree. The natural appetites of children are indeed the beſt rule by which we can judge of what is proper or improper for them. They muſt no doubt be regulated as to the quantity; but we may be aſſured that what a child is very fond of will not hurt it if taken in moderation. When children are ſick, they refuſe every thing but the breaſt; and if their diſtemper be very ſevere, they will refuſe it alſo; and in this caſe they ought not to be preſſed to take food of any kind: but when the ſickneſs goes off, their appetite alſo returns, and they will require the uſual quantity of food.

According to Dr Armſtrong, *inward fits*, as they are called, are in general the firſt complaint that appears in children; and as far as he has obſerved, moſt, if not all infants, during the firſt months, are more or leſs liable to them. The ſymptoms are theſe. The child appears as if it was aſleep, only the eyelids are not quite cloſed; and if you obſerve them narrowly, you will ſee the eyes frequently twinkle, with the white of them turned up. There is a kind of tremulous motion in the muſcles of the face and lips, which produces ſomething like a ſimper or a ſmile, and ſometimes almoſt the appearance of a laugh. As the diſorder increaſes, the infant's breath ſeems now and then to ſtop for a little; the noſe becomes pinched; there is a pale circle about the eyes and mouth, which ſometimes changes to livid, and comes and goes by turns; the child ſtarts, eſpecially if you go to ſtir it though ever ſo gently, or if you make any noiſe near it. Thus diſturbed, it ſighs, or breaks wind, which gives relief for a little, but preſently it relapſes into the dozing. Sometimes it ſtruggles hard before it can break wind, and ſeems as if falling into convulſions; but a violent burſt of wind from the ſtomach, or vomiting, or a loud fit of crying, ſets all to rights again. As the child increaſes in ſtrength, theſe fits are the more apt to go off ſpontaneouſly and by degrees; but in caſe they do not, and if there is nothing done to remove them, they either, degenerate into an almoſt conſtant drowſineſs, (which is ſucceeded by a fever and the thruſh), or elſe they terminate in vomitings, ſour, curdled, or green ſtools, the watery-gripes, and convulſions. The thruſh indeed very often terminates in theſe laſt ſymptoms. Wherefore, as theſe complaints naturally run into one another, or ſucceed one another, they may be conſidered, in a manner, as only different ſtages of the ſame diſeaſe, and which derive their origin from the ſame cauſe. Thus, the inward fits may be looked upon as the firſt ſtage of the diſorder; the fever, and thruſh (when it happens), as the ſecond; the vomitings, ſour, curdled, green or watery ſtools, as the third; and convulſions, as the laſt.

As to the cauſe of theſe complaints, he obſerves, that in infants the glandular ſecretions, which are all more or leſs glutinous, are much more copious than in adults. During the time of ſucking, the glands of the mouth and fauces being ſqueezed by the contraction of the muſcles, ſpue out their contents plentifully; which afterwards mixing with the mucus of the gullet and ſtomach, render the milk of a ſlimy conſiſtence, by which means it is not ſo readily abſorbed into the lacteals; and as in moſt infants there is too great an acidity in the ſtomach, the milk is thereby curdled, which adds to the load; hence ſickneſs and ſpaſms, which, being communicated by ſympathy to the nerves of the gullet and fauces, produce the convulſive motions above deſcribed, which go commonly by the name of *inward fits*. The air, likewiſe, which is drawn in during ſuction, mixing with the milk, &c. in the ſtomach, perhaps contributes towards increaſing the ſpaſms abovementioned. Dr Armſtrong is the more induced to attribute theſe fits to the cauſes now aſſigned, that they always appear immediately after ſucking or feeding; eſpecially if the child has been long at the breaſt, or fed heartily, and has been laid down to ſleep without having firſt broken wind, which ought never to be done. Another reaſon is, that nothing relieves them ſo ſoon as belching or vomiting; and the milk or food they throw up is generally either curdled, or mixed with a large quantity of heavy phlegm. In caſe they are not relieved by belching or vomiting, the fits ſometimes continue a good while, and gradually abate, according as the contents of the ſtomach are puſhed into the inteſtines; and as ſoon as the former is pretty well emptied, the child is waked by hunger, cries, and wants the breaſt; he ſucks, and the ſame proceſs is repeated.—Thus, ſome children for the firſt weeks are kept almoſt always in a doſe, or ſeemingly ſo; eſpecially if the nurſes, either through lazineſs or want of ſkill, do not take care to rouſe them when they perceive that it is not a right ſleep, and keep them awake at proper intervals. This dozing is reckoned a bad ſign amongſt experienced nurſes; who look upon it as a forerunner of the thruſh, as indeed it often is; and therefore, when it happens, we ought to be upon our guard to uſe the neceſſary precautions for preventing that diſorder.

For theſe diſorders, the only remedy recommended by Dr Armſtrong is antimonial wine, given in a few drops, according to the age of the infant. By this means the ſuperabundant mucus will no doubt be evacuated; but at the ſame time we muſt remember, that this evacuation can only *palliate*, and not cure the diſeaſe. This can only be effected by tonics; and a decoction of the Peruvian bark, made into a ſyrup, will readily be taken by infants, and may be ſafely exhibited from the very day they come into the world, or as ſoon as their bowels are emptied of the meconium by the mother's milk or any other means.

Dr Clarke obſerves, that *fractures* of the *limbs*, and *compreſſions* of the *brain*, often happen in difficult labours; and that the latter are often followed by convulſions ſoon after delivery. In theſe caſes, he ſays, it will be adviſable to let the navel-ſtring bleed two or three ſpoonfuls before it be tied. Thus the oppreſſion of the brain will be relieved, and the diſagreeable conſequences juſt mentioned will be prevented. But if this has been neglected, and fits have actually come on, we muſt endeavour to make a revulſion by all the means in our power; as by opening the jugular vein, procuring an immediate diſcharge of the urine and meconium, and applying ſmall bliſters to the back, legs, or behind the ears. The ſemicupium, too, would ſeem to be uſeful in this caſe, by driving the oppreſſive load of fluids from the head and upper parts.

It ſometimes happens after a tedious labour, that the child is ſo faint and weak as to diſcover little or no ſigns of life. In ſuch a caſe, after the uſual cleanſing, the body ſhould be immediately wrapped in warm flannel, and briſkly toſſed about in the nurſe's arms, in order, if poſſible, to excite the languid circulation. If this fail, the breaſt and temples may be rubbed with brandy or other ſpirits; or the child may be provoked to cry, by whipping, or other ſtimulating methods, as the application of onion, or ſalt and ſpirit of hartſhorn, to the mouth and noſtrils. But after all theſe expedients have been tried in vain, and the recovery of the child abſolutely deſpaired of, it has ſometimes been happily revived by introducing a ſhort catheter or blow-pipe into the mouth, and gently blowing into the lungs at different intervals. Such children, however, are apt to remain weak for a conſiderable time, ſo that it is often no eaſy matter to rear them; and therefore particular care and tenderneſs will be required in their management, that nothing may be omitted which can contribute either to their preſervation or the improvement of their ſtrength and vigour.

All the diſorders which ariſe from a *retention* of the *meconium*, ſuch as the *red gum*, may eaſily be removed by the uſe of gentle laxatives; but the great ſource of mortality among children is the *breeding* of their *teeth*. The uſual ſymptoms produced by this are fretting; reſtleſſneſs; frequent and ſudden ſtartings, eſpecially in ſleep; coſtiveneſs; and ſometimes a violent diarrhœa, fever, or convulſions. In general, thoſe children breed their teeth with the greateſt eaſe, who have a moderate laxity of the bowels, or a plentiful flow of ſaliva during that time.

In mild caſes, we need only, when neceſſary, endeavour to promote the means by which nature is obſerved to carry on the buſineſs of dentition in the eaſieſt manner. For this purpoſe, if a coſtiveneſs be threatened, it muſt be prevented, and the body kept always gently open; and the gums ſhould be relaxed by rubbing them frequently with ſweet oils, or other ſoftening remedies of that kind, which will greatly diminiſh the tenſion and pain. At the ſame time, as children about this period are generally diſpoſed to chew what ever they get into their hands, they ought never to be without ſomething that will yield a little to the preſſure of their gums, as a cruſt of bread, a wax-candle, a bit of liquorice-root, or ſuch like; for the repeated muſcular action, occaſioned by the conſtant biting and gnawing at ſuch a ſubſtance, will increaſe the diſcharge from the ſalivary glands, while the gums will be ſo forcibly preſſed againſt the advancing teeth, as to make them break out much ſooner, and with leſs uneaſineſs, than would otherwiſe happen. Some likewiſe recommend a ſlice of the rind of freſh bacon, as a proper maſticatory for the child, in order to bring moiſture into its mouth, and facilitate the eruption of the teeth by exerciſing the gums. If theſe means, however, prove ineffectual, and bad ſymptoms begin to appear, the patient will often be relieved immediately by cutting the inflamed gum down to the tooth, where a ſmall white point ſhows the latter to be coming forward. When the pulſe is quick, the ſkin hot and dry, and the child of a ſufficent age and ſtrength, emptying the veſſels by bleeding, eſpecially at the jugular, will frequently be neceſſary here, as well as in all other inflammatory caſes; and the belly ſhould be opened from time to time by emollient oily or mucilaginous glyſters. But, on the contrary, if the child be low, ſunk, and much weakened, repeated doſes of the ſpirit of hartſhorn, and the like reviving medicines, ought to be preſcribed. Bliſters applied to the back, or behind the ears, will often be proper in both caſes. A prudent adminiſtration of opiates, when their uſe is not forbid by coſtiveneſs or otherwiſe, is ſometimes of great ſervice in difficult teething, as, by mitigating pain, they have a tendency to prevent its bad effects, as a fever, convulſions, or other violent ſymptoms; and often they are abſolutely neceſſary, along with the teſtaceous powders, for checking an immoderate diarrhœa.

When cathartics are neceſſary, but the child ſeems too tender and weak to bear their immediate operation, they ſhould be given to the nurſe; in which caſe they will communicate ſo much of their virtues to the milk as will be ſufficient to purge the infant. This at leaſt certainly holds with regard to ſome cathartics; ſuch, for example, as the infuſion of ſenna, particularly if a very weak infuſion be employed, and not uſed to ſuch an extent as to operate as a purgative to the nurſe.

As moſt young children if in health, naturally ſleep much, and pretty ſoundly, we may always be apt to ſuſpect that ſomething is amiſs when they begin to be ſubject to *watching* and *frights*; ſymptoms which ſeldom or never occur but either in conſequence of ſome preſent diſorder not yet taken notice of, or as the certain forerunners of an approaching indiſpoſition. We ſhould immediately, therefore, endeavour to find out their cauſe, that we may uſe every poſſible means to remove or prevent it; otherwiſe the want of natural reſt, which is ſo very prejudical to perſons of all ages, will ſoon reduce the infant to a low and emaciated ſtate, which may be followed by an hectic fever, diarrhœa, and all the other conſequences of weakneſs and debility. Theſe ſymptoms, being always the effects of irritation and pain, may proceed, in very young infants, from crudities or other affections of the *primæ viæ* producing flatulencies or gripes; about the ſixth or ſeventh month, they may be owing to that uneaſineſs which commonly accompanies the breeding of the teeth; and after a child is weaned, and begins to uſe a different kind of food, worms become frequently an additional cauſe of watchings and diſturbed ſleep. Hence, to give the neceſſary relief on theſe occaſions, the original complaint muſt firſt be aſcertained from the child's age and other concomitant circumſtances, and afterwards treated according to the nature of the caſe. Women and nurſes are too apt to have recourſe to opiates in the watchings of children, eſpecially when their own reſt happens to be much diſturbed by their continual noiſe and clamour. But this practice is often prejudicial, and never ought to have place when the belly is in the leaſt obſtructed.

There is no complaint more frequent among children than that of worms, the general ſymptoms of which have been already enumerated; but it muſt be obſerved, that all the ſymptoms commonly attributed to worms alone, may be produced by a foulneſs of the bowels. Hence practitioners ought never to reſt ſatisfied with adminiſtering to their patients ſuch medicines,

cines as are poſſeſſed only of an anthelmintic quality, but to join them with thoſe which are particularly adapted for cleanſing the *primæ viæ*; as it is uncertain whether a foulneſs of the bowels may not be the cauſe of all the complaints. This practice is ſtill the more adviſable, on account of viſcid humours in the inteſtines affording lodgment to the ova of worms; which, without the convenience of ſuch a receptacle, would be more ſpeedily diſcharged from the body.

The difficulty of curing what is called a *worm-fever*, ariſes, according to Dr Muſgrave, from its being frequently attributed to worms, when the cauſe of the diſorder is of a quite different nature. He does not mean to deny that worms do ſometimes abound in the human body, nor that the irritation cauſed by them does ſometimes produce a fever; but he apprehends theſe caſes to be much more uncommon than is generally imagined, and that great miſchief is done by treating ſome of the diſorders of children as worm caſes, which really are not ſo. Dr Hunter, it is obſerved, is of the ſame opinion on this point; and he has, we are told, diſſected great numbers of children who have been ſuppoſed to die of worm-fevers, and whoſe complaints were of courſe treated as proceeding from worms, in whom however, there appeared, upon diſſection, to be not only no worms, but evident proofs of the diſorder's having been of a very different nature.

The *ſpurious worm-fever*, as Dr Muſgrave terms it, has, in all the inſtances he has ſeen of it, ariſen evidently from the children having been indulged with too great quantities of fruit; though a poor cold diet may, he thinks, occaſionally give birth to it. Every ſort of fruit eaten in exceſs will probably produce it; but an immoderate uſe of cherries ſeem to be the moſt common cauſe of it. The approach of this diſorder has a different appearance, according as it riſes from a habit of eating fruit in rather too large quantities, or from an exceſſive quantity eaten at one time. In the former caſe, the patient gradually grows weak and languid; his colour becomes pale and livid; his belly ſwells and grows hard; his appetite and digeſtion are deſtroyed; his nights grow reſtleſs, or at leaſt his ſleep is much diſturbed with ſtartings, and then the fever ſoon follows; in the progreſs of which, the patient grows comatoſe, and at times convulſed; in which ſtate when it takes place to a high degree, he often dies. The pulſe at the wriſt, though quick, is never ſtrong or hard; the carotids, however, beat with great violence, and elevate the ſkin ſo as to be diſtinctly ſeen at a diſtance. The heat is at times conſiderable, eſpecially in the trunk; though at other times, when the brain is much oppreſſed, it is little more than natural. It is ſometimes accompanied by a violent pain of the epigaſtric region, though more commonly the pain is ſlight, and terminates in a coma; ſome degree of pain, however, ſeems to be inſeparable from it, ſo as clearly to diſtinguiſh this diſorder from other comatoſe affections.

When a large quantity of fruit has been eaten at once, the attack of the diſorder is inſtantaneous, and its progreſs rapid; the patient often paſſing, in the ſpace of a few hours, from apparently perfect health, to a ſtupid, comatoſe, and almoſt dying ſtate. The ſymptoms of the fever, when formed, are in both caſes nearly the ſame; except that, in this latter ſort, a little purulent matter is ſometimes diſcharged, both by vomit and ſtool, from the very firſt day. The ſtools, in both caſes, exhibit ſometimes a kind of curd reſembling curdled milk, at other times a floating ſubſtance is obſerved in them; and ſometimes a number of little threads and pellicles, and now and then a ſingle worm.

Strong purgatives, or purges frequently repeated, in this diſorder, are greatly condemned by Dr Armſtrong, as they in general not only aggravate the ſymptoms already preſent, but are ſometimes the origin of convulſions. Bloodletting is not to be thought of in any ſtage of the diſorder.

Although frequent purging, however, be not recommended, yet a ſingle vomit and purge are adviſed in the beginning of the diſorder, with a view to evacuate ſuch indigeſted matter and mucus as happens to remain in the ſtomach and bowels. Theſe having operated properly, there is ſeldom occaſion for repeating them; and it is ſufficient, if the body be coſtive, to throw up, every ſecond or third day, a clyſter, compoſed of ſome grains of aloes, diſſolved in five ounces of infuſion of chamomile.

The principal part of the cure, however, depends upon external applications to the bowels and ſtomach; and as the cauſe of the diſorder is of a cold nature, the applications muſt be warm, cordial, and invigorating; and their action muſt be promoted by conſtant actual heat.

The following is the form recommended.

" Take of leaves of wormwood and rue, each equal parts: make a ſaturated decoction in a ſufficient quantity of water, with which foment the region of the ſtomach and abdomen for a quarter of an hour, repeating the fomentation every three or four hours. A poultice of the boiled herbs is to be applied after the fomentation, and conſtantly renewed as it cools." For internal uſe, the following is all that has been found neceſſary. " Take of ſpirituous and ſimple cinnamon-water, each half an ounce; oil of almonds, an ounce and an half: balſamic ſyrup, three drachms. Mix, and ſhake the vial when uſed." From two to ſix drachms are given every third hour.

When any nervous ſymptoms come on, or remain after the diſorder is abated, they are eaſily removed by giving a pill with a grain or two of aſafœtida once or twice a-day.

The diagnoſtics of worms are very uncertain; but, even in real worm caſes, the treatment above recommended would, it is imagined, be much more efficacious than the practice commonly had recourſe to. As worms either find the conſtitution weakly, or very ſoon make it ſo, the frequent repetition of purges, particularly mercurials, cannot but have a pernicious effect. Bares-foot is ſtill more exceptionable, being in truth to be rather ranked among poiſons than medicines. Worm-ſeed and bitters are too offenſive to the palate and ſtomach to be long perſiſted in, though ſometimes very uſeful. The powder of coralline creates diſguſt by its quantity; and the infuſion of pink-root is well known to occaſion now and then vertiginous complaints and fits.

Fomenting the belly night and morning with a ſtrong decoction of rue and worm-wood, is much recommended. It is a perfectly ſafe remedy, and, by invigorating the bowels, may thereby have ſome influence in rendering them capable of expelling ſuch worms

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worms as they happen to contain. After the fomentation, it is adviſed to anoint the belly with a liniment compoſed of one part of eſſential oil of rue, and two parts of a decoction of rue in ſweet oil. It is, however, a matter of great doubt whether theſe external applications, in conſequence of the articles with which they are impregnated, exert any influence on the worms themſelves.

The diet of children diſpoſed to worms, ſhould be warm and nouriſhing, conſiſting in part at leaſt of animal food, which is not the worſe of being a little ſeaſoned. Their drink may be any kind of beer that is well hopped, with now and then a ſmall draught of porter or negus. A total abſtinence from butter is not ſo neceſſary, perhaps, as is generally imagined. Poor cheeſe muſt by all means be avoided; but ſuch as is rich and pungent, in a moderate quantity, is particularly ſerviceable. In the ſpurious worm-fever, the patient ſhould be ſupported occaſionally by ſmall quantities of broth; and, at the cloſe of it, when the appetite returns, the firſt food given ſhould be of the kinds above recommended.

The diet here recommended will, perhaps, be thought extraordinary, as the general idea is at preſent, that, in the management of children, nothing is ſo much to be avoided as repletion and rich food. It is no doubt an error to feed children too well, or to indulge them with wine and rich ſauces; but it is equally an error to confine them to too ſtrict or too poor a diet, which weakens their digeſtion, and renders them much more ſubject to diſorders of every kind, but particularly to diſorders of the bowels. In regard to the ſpurious worm-fever, if it be true that acid fruits too plentifully eaten are the general cauſe of it, it follows as a conſequence, that a warm nutritious diet, moderately uſed, will moſt effectually counteract the miſchief, and ſooneſt reſtore the natural powers of the ſtomach. Beſides, if the diſorder does not readily yield to the methods here directed, as there are many examples of its terminating by an inflammation and ſuppuration of the navel, it is highly adviſable to keep this probability in view, and, by a moderate allowance of animal-food, to ſupport thoſe powers of nature, from which only ſuch a happy criſis is to be expected.

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The application of this ſubtile fluid to medicinal purpoſes was thought of ſoon after the diſcovery of the electric ſhock; and after various turns of reputation its medical virtues ſeem now to be pretty well eſtabliſhed. After giving ſo particular a deſcription of the electrical apparatus under the proper article, it would here be ſuperfluous to ſay any thing farther on that head. We ſhall only obſerve, that Mr Cavallo, who has publiſhed the lateſt and the beſt treatiſe on Medical Electricity entirely diſapproves of giving violent ſhocks, and finds it moſt efficacious to expoſe the patient to the electrical aura diſcharged from an iron or a wooden point; or if ſhocks are given, they ſhould be very ſlight, and not exceed 12 or 14 at a time. In this way he recommends it as effectual in a great number of diſorders. The patient may be electrified from three to ten minutes; but if ſparks are drawn, they ſhould not exceed the number of ſhocks abovementioned.

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Rheumatic diſorders, even of long ſtanding, are relieved, and generally quite cured, by only drawing the electric fluid with a wooden point from the part, or by drawing ſparks through flannel. The operation ſhould be continued for about four or five minutes, repeating it once or twice every day.

Deafneſs, except when it is occaſioned by obliteration or other improper configuration of the parts, is either entirely or partly cured by drawing the ſparks from the ear with the glaſs-tube director, or by drawing the fluid with a wooden point. Sometimes it is not improper to ſend exceedingly ſmall ſhocks (for inſtance, of one-thirteenth of an inch) from one ear to the other.—It has been conſtantly obſerved, that whenever the ear is electrified, the diſcharge of the wax is conſiderably promoted.

The toothach, occaſioned by cold, rheumatiſm, or inflammation, is generally relieved by drawing the electric fluid with a point, immediately from the part, and alſo externally from the face. But when the body of the tooth is affected, electrization is of no uſe; for it ſeldom or never relieves the diſorder, and ſometimes increaſes the pain to a prodigious degree.

Swellings in general, which do not contain any *matter*, are frequently cured by drawing the electric fluid with a wooden point. The operation ſhould be continued for three or four minutes every day.—It is very remarkable, that in ſome caſes of white ſwellings, quite cured by means of electricity, the bones and catrilages were in ſome meaſure disfigured.

Inflammations of every ſort are generally relieved by a very gentle electrization.

In inflammmations of the eyes, the throwing of the electric fluid by means of a wooden point is often attended with great benefit; the pain being quickly abated, and the inflammation being generally diſſipated in a few days. In theſe caſes, the eye of the patient muſt be kept open; and care ſhould be taken not to bring the wooden point very near it, for fear of cauſing any ſpark. Sometimes it is ſufficient to throw the fluid with a metal point; for in theſe caſes, too great an irritation ſhould be always avoided. It is not neceſſary to continue this operation for three or four minutes without intermiſſion, but after throwing the fluid for about half a minute, a ſhort time may be allowed to the patient to reſt and to wipe his tears, which generally flow very copiouſly; then the operation may be continued again for another half minute, and ſo on for four or five times every day.

The *gutta ſerena* has been ſometimes cured by electrization; but at the ſame time it muſt be confeſſed, it has proved ineffectual in many ſuch caſes, in which it was adminiſtered for a long time and with all poſſible attention. However, it has never been known that any body was made worſe by it. The beſt method of adminiſtering electricity in ſuch caſes, is firſt to draw the electric fluid with a wooden point for a ſhort time, and then to ſend about half a dozen of ſhocks of one-twentieth of an inch from the back and lower part of the head to the fore head, very little above the eye.

A remarkable diſeaſe of the eye was ſome time ago perfectly cured by electrization; it was an opacity of the vitreous humour of the eyes.

All theſe caſes of *fiſtula lacrymalis* which Mr Cavallo hath known to have been electrified by perſons of ability for a ſufficient time, have been entirely cured. The method generally practiſed has been that of drawing the fluid with a wooden point, and to take very ſmall ſparks from the part, The operation may be continued for about three or four minutes every day. It remarkable, that in thoſe caſes, after curing the fiſtula lacrymalis, no other diſeaſe was occaſioned by it, as blindneſs, inflammations, &c. by ſuppreſſing that diſcharge.

Palſies are ſeldom perfectly cured by means of electricity, eſpecially when they are of long ſtanding; but they are generally relieved to a certain degree. The method of electrifying in thoſe caſes, is to draw the fluid with the wooden point, and to draw ſparks thro' flannel, or through the uſual coverings of the part if they are not too thick. The operation may be continued for about five minutes per day.

Ulcers, or open ſores of every kind, even of a long ſtanding, are generally diſpoſed to heal by electrization. The general effects are a diminution of the inflammation, and firſt a promotion of the diſcharge of properly formed matter; which diſcharge gradually leſſens, according as the limits of the ſore contract, till it be quite cured. In theſe caſes the gentleſt electrization muſt be uſed, in order to avoid too great an irritation, which is generally hurtful. To draw or throw the fluid with a wooden or even with a metal point, for three or four minutes per day, is fully ſufficient.

Cutaneous eruptions have been ſucceſsfully treated with electrization; but in theſe caſes it muſt be obſerved, that if the wooden point be kept too near the ſkin, ſo as to cauſe any conſiderable irritation, the eruption will be cauſed to ſpread more; but if the point be kept at about ſix inches diſtance, or farther if the electrical machine be very powerful, the eruptions will be gradually diminiſhed, till they are quite cured. In this kind of diſeaſe, the immediate and general effect of the wooden point is to occaſion a warmth about the electrified part, which is always a ſign that the electrization is rightly adminiſtered.

The application of electricity has perfectly cured various caſes of *St Vitus's dance*, or of that diſeaſe which is commonly called ſo; for it is the opinion of ſome very learned phyſicians, that the real diſeaſe called *St Vitus's dance* which formerly was more frequent than it is at preſent, is different from that which now goes under that name. In this diſeaſe ſhocks of about one-tenth of an inch may be ſent through the body in various directions, and alſo ſparks may be taken. But if this treatment prove very diſagreeable to the patient then the ſhocks muſt be leſſened, and even omitted; inſtead of which ſome other more gentle applications muſt be ſubſtituted.

Scrophulous tumors, when they are juſt beginning, are generally cured by drawing the electric fluid with a wooden or metal point from the part. This is one of thoſe kinds of diſeaſes in which the action of electricity requires particularly the aid of other medicines in order to effect a cure more eaſily; for ſcrophulous affections commonly accompany a great laxity of the habit, and a general cachexy, which muſt be obviated by proper remedies.

In *cancers*, the pains only are commonly alleviated by drawing the electric fluid with a wooden or metal point. Mr Cavallo, however, mentions one caſe in which a moſt confirmed cancer of very long ſtanding, on the breaſt of a woman, had been much reduced in ſize. It is remarkable, that this patient was ſo far relieved by drawing the fluid with a metal point from the part, that the excruciating pains ſhe had ſuffered for many years did almoſt entirely diſappear; and alſo, that when the electric fluid was drawn by means of a wooden point, the pains did rather increaſe.

Abſceſſes, when they are in their beginning, and in general whenever there is any tendency to form matter, are diſperſed by electrization. Lately, in a caſe in which matter was formed upon the hip, called the *lumbar abſceſs*, the diſeaſe was perfectly cured by means of electricity. The *ſciatica* has alſo been often cured by it. In all ſuch caſes, the electric fluid muſt be ſent through the part by means of two directors applied to oppoſite parts, and in immediate contact either with the ſkin, or with the coverings, when theſe are very thin. It is very remarkable, that the mere paſſage of the electric fluid in this manner is generally felt by the patients afflicted with thoſe diſorders, nearly as much as a ſmall ſhock is felt by a perſon in good health. Sometimes a few ſhocks have been alſo given, but it ſeems more proper to omit them: becauſe ſometimes, inſtead of diſperſing, they rather accelerate the formation of matter.

In caſes of *pulmonary inflammations*, when they are in the beginning, electrization has been ſometimes beneficial; but in confirmed diſeaſes of the lungs, it does not ſeem to have ever afforded any unqueſtionable benefit; however, it ſeems that in ſuch caſes the power of electricity has been but ſeldom tried.

Nervous headachs, even of a long ſtanding, are generally cured by electrization. For this diſeaſe, the electric fluid muſt be thrown with a wooden, and ſometimes even with a metal point, all round the head ſucceſſively. Sometimes exceedingly ſmall ſhocks have been adminiſtered; but theſe can ſeldom be uſed, becauſe the nerves of perſons ſubject to this diſeaſe are ſo very irritable, that the ſhocks, the ſparks, and ſometimes even the throwing the electric fluid with a wooden point kept very near the head, throw them into convulſions.

The application of electricity has often been found beneficial in the *dropſy* when juſt beginning, or rather in the tendency to a dropſy; but it has never been of any uſe in advanced dropſies. In ſuch caſes, the electric fluid is ſent through the part, in various directions, by means of two directors, and ſparks are alſo drawn acroſs the flannel or the cloaths; keeping the metal rod in contact with them, and ſhifting it continually from place to place. This operation ſhould be continued at leaſt ten minutes, and ſhould be repeated once or twice a-day.—Perhaps in thoſe caſes, a ſimple electrization (viz, to inſulate the patient, and to connect him with the prime conductur whilſt the machine is in action), continued for a conſiderable time, as an hour or two, would be more beneficial.

The *gout*, extraordinary as it may appear, has certainly been cured by means of electricity, in various inſtances. The pain has been generally mitigated, and ſometimes the diſeaſe has been removed ſo well as not

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to return again. In thoſe caſes, the electric fluid has been thrown by means of a wooden point, although ſometimes, when the pain was too great, a metal point only has been uſed.

Agues have not unfrequently been cured by electricity, ſo that ſometimes one electrization or two have been ſufficient. The moſt effectual and ſure method has been that of drawing ſparks through flannel, or the cloaths, for about ten minutes or a quarter of an hour. The patients may be electrified either at the time of the fit, or a ſhort while before the time in which it is expected.

The ſuppreſſion of the menſes, which is a diſeaſe of the female ſex that often occaſions the moſt diſagreeable and alarming ſymptoms, is often ſucceſsfully and ſpeedily cured by means of electricity, even when the diſeaſe is of long ſtanding, and after the moſt powerful medicines uſed for it have proved ineffectual. The caſes of this ſort in which electrization has proved uſeleſs are ſo few, and the ſucceſsful ones ſo numerous, that the application of electricity for this diſeaſe may be juſtly conſidered as an efficacious and certain remedy. Great attention and knowledge is required, in order to diſtinguiſh the arreſt of the menſes from a ſtate of pregnancy. In the former, the application of electricity, as we obſerved above, is very beneficial; whereas, in the latter, it may be attended with very diſagreeable effects: it is therefore a matter of great importance to aſcertain the real cauſe of the diſeaſe, before the electricity be applied in thoſe caſes. Pregnant women may be electrified for other diſeaſes, but always uſing very gentle means, and directing the electric fluid through other parts of the body diſtant from thoſe ſubſervient to generation. In the real ſuppreſſion of the menſes, ſmall ſhocks, *i. e.* of about one-twentieth of an inch, may be ſent through the pelvis; ſparks may be taken through the cloaths from the parts adjacent to the ſeat of the diſeaſe; and alſo the electric fluid may be tranſmitted by applying the metallic or wooden extremities of two directors to the hips, in contact with the clothes; part of which may be removed in caſe they be too thick. Thoſe various applications of electricity ſhould be regulated according to the conſtitution of the patient. The number of ſhocks may be about 12 or 14. The other applications may be continued for two or three minutes; repeating the operation every day. But either ſtrong ſhocks, or a ſtronger application of electricity than the patient can conveniently bear, ſhould be carefully avoided; for by thoſe means, ſometimes more than a ſufficient diſcharge is occaſioned, which is not eaſily cured. In caſes of uterine hæmorrhagies, it is not known that the application of electricity was ever beneficial. Perhaps a very gentle electrization, ſo as to keep the patient inſulated and connected with the prime conductor whilſt the electrical machine is in action, may be of ſome benefit.

In reſpect to *unnatural diſcharges* and *fluxes* in general, it may be obſerved, that ſome diſcharges are quite unnatural or adventitious, as the fiſtula lacrymalis, and ſome ſpecies of the venereal diſeaſe; but others are only increaſed natural diſcharges, ſuch as the menſes, perſpiration, &c. Now the power of electricity in general has been found more beneficial for the firſt than for the ſecond ſort of diſcharges, which are moſtly increaſed by it.

In the *venereal diſeaſe*, electrization has been generally forbidden; having commonly increaſed the pains, and other ſymptoms, rather than diminiſhed them. Indeed, conſidering that any ſort of ſtimulus has been found hurtful to perſons afflicted with that diſorder, it is no wonder that electricity has produced ſome bad effects, eſpecially in the manner it was adminiſtered ſome time ago, viz. by giving ſtrong ſhocks. However, it has been lately obſerved, that a very gentle application of electricity, as drawing the fluid by means of a wooden or metal point, is peculiarly beneficial in various caſes of this kind, even when the diſeaſe has been of long ſtanding. Having remarked above, that tumors, when juſt beginning, are diſperſed, and that unnatural diſcharges are gradually ſuppreſſed by a judicious electrization, it is ſuperfluous to deſcribe particularly thoſe ſtates of the venereal diſeaſe in which electricity may be applied; it is only neceſſary to remind the operator to avoid any conſiderable ſtimulus in caſes of this ſort.

The application of electricity has been found alſo beneficial in other diſeaſes beſides thoſe mentioned above; but as the facts are not ſufficiently numerous, ſo as to afford the deduction of any general rules, we have not thought proper to take any particular notice of them.

We may laſtly obſerve, that, in many caſes, the help of other remedies to be preſcribed by the medical practitioner will be required to aſſiſt the action of electricity, which by itſelf would perhaps be uſeleſs; and, on the other hand, electrization may often be applied to aſſiſt the action of other remedies, as of ſudorifics, ſtrengthening medicines, &c.

Of FIXED AIR *as a* MEDICINE. 412

THE antiſeptic qualities of fixed air, or as it is now more generally called of the *aerial* or *carbonic acid*, have of late introduced it as a medicine in caſes of putrid diſorders, and various other complaints.—

Dr Percival obſerves, that though fatal if inſpired in a very large quantity, it may in ſmaller quantities be breathed without danger or uneaſineſs. And it is a confirmation of this concluſion, that at Bath, where the waters copiouſly exhale this mineral ſpirit, the bathers inſpire it with impunity. At Buxton alſo, where the bath is in a cloſe vault, the effects of ſuch effluvia, if noxious, muſt certainly be perceived.

Encouraged by theſe and ſome other conſiderations, he has adminiſtered fixed air in more than 30 caſes of the *phthiſis pulmonalis*, by directing his patients to inſpire the ſteams of an efferveſcing mixture of chalk and vinegar through the ſpout of a coffee-pot. The hectic fever has in ſeveral inſtances been conſiderably abated, and the matter expectorated has become leſs offenſive and better digeſted. He has not, however, been ſo fortunate in any one caſe as to effect a cure; although the uſe of mephitic air has been accompanied with proper internal medicines. But Dr Withering has been more ſucceſsful. One phthiſical patient under his care, by a ſimilar courſe, entirely recovered; another was rendered much better; and a third, whoſe caſe was truly deplorable, ſeemed to be kept alive by it more than two months. It may be proper to obſerve, that fixed air can only be employed with any proſpect of ſucceſs in the latter ſtages of the *phthiſis pulmonalis*, when a purulent expectoration takes place. After the rupture and diſcharge of a vomica alſo, ſuch a remedy promiſes to be a powerful palliative. Antiſeptic fumigations and vapours have been long employed, and much extolled, in caſes of this kind. The following experiment was made to determine whether their efficacy in any degree depends on the ſeparation of fixed air from their ſubſtance.

One end of a bent tube was fixed in a phial full of lime-water; the other end in a bottle of the tincture of myrrh. The junctures were carefully luted; and the phial containing the tincture of myrrh was placed in water, heated almoſt to the boiling point, by the lamp of a tea-kettle. A number of air-bubbles were ſeparated, but probably not of the mephitic kind; for no precipitation enſued in the lime-water. This experiment was repeated with the *tinct. Tolutana Ph. Ed.* and with *ſp. vinoſ. camph.* and the reſult was entirely the ſame. The medicinal action therefore of the vapours raiſed from ſuch tinctures, cannot be aſcribed to the extrication of fixed air; of which it is probable bodies are deprived by chemical ſolution as well as by mixture.

If mephitic air be thus capable of correcting purulent matter in the lungs, we may reaſonably infer it will be equally uſeful when applied externally to *foul ulcers*; and experience confirms the concluſion. Even the ſanies of a cancer, when the carrot-poultice failed, has been ſweetened by it, the pain mitigated, and a better digeſtion produced. But though the progreſs of the cancer ſeems to be checked by the fixed air, it is to be feared that a cure will not be effected. A palliative remedy, however, in a diſeaſe ſo deſperate and loathſome, may be conſidered as a very valuable acquiſition. Perhaps nitrous air might be ſtill more efficacious. This ſpecies of factitious air is obtained from all the metals, except zinc, by means of the nitrous acid; as a ſweetener and antiſeptic, it far ſurpaſſes fixed air.

In the ulcerous *ſore throat*, much advantage has been experienced from the vapours of effervеſcing mixtures drawn into the *fauces*. But this remedy ſhould not ſuperſede the uſe of other antiſeptic applications.

In *malignant fevers*, wines abounding with fixed air may be adminiſtered to check the ſeptic ferment, and ſweeten the putrid *colluvies* in the *primæ viæ*. If the laxative quality of ſuch liquors be thought an objection to the uſe of them, wines of a greater age may be given, impregnated with aerial acid.—The patient's common drink might alſo be medicated in the ſame way. A putrid diarrhœa frequently occurs in the latter ſtage of ſuch diſorders; and it is a moſt alarming and dangerous ſymptom. If the diſcharge be ſtopped by aſtringents, a putrid *fomes* is retained in the body, which aggravates the delirium, and increaſes the fever. On the contrary, if it be ſuffered to take its courſe, the ſtrength of the patient muſt ſoon be exhauſted, and death unavoidably enſue. The injection of mephitic air into the inteſtines, under theſe circumſtances, bids fair to be highly ſerviceable. And in ſome caſes of this kind the gas emitted from a mixture of chalk and oil of vitriol conveyed into the body by the machine employed for tobacco-clyſters, quickly reſtrained the diarhœa, corrected the heat and fetor of the ſtools, and in a ſhort time removed every ſymptom of danger.

As a *ſolvent* of the *calculus*, its virtues have been already mentioned; but the experiments made on that ſubject do not determine the matter with ſufficient accuracy.

Obſervations on the MEANS *of preſerving* HEALTH.

I. RULES *for the management of* VALETUDINARIANS. 413

THAT part of the medical ſyſtem which lays down rules for the preſervation of health, and prevention of diſeaſes, termed *Hygeine*, is not to be ſtrictly underſtood as if it reſpected only thoſe people who enjoy perfect health, and who are under no apprehenſions of diſeaſe, for ſuch ſeldom either deſire or attend to medical advice; but ſhould rather be conſidered as relating to valetudinarians or to ſuch as, though not actually ſick, may yet have ſufficient reaſon to fear that they will ſoon become ſo: hence it is that the rules muſt be applied to correct morbific diſpoſitions, and to obviate the various things that were ſhown to be the remote or poſſible cauſes of diſeaſes.

From the way in which the ſeveral temperaments are uſually mentioned by ſyſtematic writers, it ſhould ſeem as if they meant that every particular conſtitution muſt be referred to one or other of the four; but this is far from being reducible to practice, ſince by much the greater number of people have conſtitutions ſo indiſtinctly marked, that it is hard to ſay to which of the temperaments they belong.

When we actually meet with particular perſons who have evidently either,

1. Too much ſtrength and rigidity of fibre, and too much ſenſibility;
2. Too little ſtrength, and yet too much ſenſibility;
3. Too much ſtrength, and but little ſenſibility; or,
4. But little ſenſibility joined to weakneſs;

we ſhould look on ſuch perſons as more or leſs in the valetudinary ſtate, who require that theſe morbific diſpoſitions be particularly watched, leſt they fall into thoſe diſeaſes which are allied to the different temperaments.

People of the firſt-mentioned temperament being liable to ſuffer from continued fevers, eſpecially of the inflammatory ſpecies, their ſcheme of preſerving health ſhould conſiſt in temperate living, with reſpect both to diet and exerciſe; they ſhould ſtudiouſly avoid immoderate drinking, and be remarkably cautious leſt any of the natural diſcharges be checked. People of this habit bear evacuations well, eſpecially bleeding: they ought not, however, to loſe blood but when they really require to have the quantity leſſened; becauſe too much of this evacuation would be apt to reduce the conſtitution to the ſecond-mentioned temperament, wherein ſtrength is deficient, but ſenſibility redundant.

Perſons of the ſecond temperament are remarkably prone to ſuffer from painful and ſpaſmodic diſeaſes, and are eaſily ruffled; and thoſe of the ſofter ſex who have

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this delicacy of habit, are very much diſpoſed to hyſterical complaints. The ſcheme here ſhould be, to ſtrengthen the ſolids by moderate exerciſe, cold bathing, the Peruvian bark, and chalybeate waters; particular attention ſhould conſtantly be had to the ſtate of the digeſtive organs, to prevent them from being overloaded with any ſpecies of ſaburra which might engender flatus, or irritate the ſenſible membranes of the ſtomach and inteſtines, from whence the diſorder would ſoon be communicated to the whole nervous ſyſtem. Perſons of this conſtitution ſhould never take any of the draſtic purges, nor ſtrong emetics; neither ſhould they loſe blood but in caſes of urgent neceſſity. But a principal ſhare of management, in theſe extremely irritable conſtitutions, conſiſts in avoiding all ſudden changes of every ſort, eſpecially thoſe with reſpect to diet and clothing, and in keeping the mind as much as poſſible in a ſtate of tranquillity: hence the great advantages which people of this frame derive from the uſe of medicinal waters drunk on the ſpot, becauſe of that freedom from care and ſerious buſineſs of every kind, which generally obtains in all the places laid out for the reception of valetudinarians.

The third-mentioned temperament, where there is an exceſs of ſtrength and but little ſenſibility, does not ſeem remarkably prone to any diſtreſſing or dangerous ſpecies of diſeaſe; and therefore it can hardly be ſuppoſed that perſons ſo circumſtanced will either of themſelves think of any particular ſcheme of management, or have recourſe to the faculty for their inſtructions: ſuch conſtitutions, however, we may obſerve, bear all kinds of evacuations well, and ſometimes require them to prevent an over-fulneſs, which might end in an oppreſſion of the brain or ſome other organ of importance.

But the fourth temperament where we have weakneſs joined to want of ſenſibility, is exceedingly apt to fall into tedious and dangerous diſeaſes, ariſing from a defect of abſorbent power in the proper ſets of veſſels, and from remiſſneſs of the circulation in general: whence corpulency, dropſy, jaundice, and different degrees of ſcorbutic affection. In order to prevent theſe, or any other ſpecies of accumulation and depravation of the animal fluids, the people of this conſtitution ſhould uſe a generous courſe of diet, with briſk exerciſe, and be careful that none of the ſecretions be interrupted, nor any of the natural diſcharges ſuppreſſed. Theſe conſtitutions bear purging well, and often require it; as alſo the uſe of emetics, which are frequently found neceſſary to ſupply the place of exerciſe, by agitating the abdominal viſcera, and are of ſervice to prevent the ſtagnation of bile, or the accumulation of mucous humours, which hinder digeſtion, and clog the firſt paſſages. The free uſe of muſtard, horſe-radiſh, and the like ſort of ſtimulating dietetics, is ſerviceable in theſe torpid habits.

When the general maſs of fluids is accumulated beyond what is conducive to the perfection of health, there ariſes what the writers term a *plethora*, which may prove the ſource of different diſeaſes; and therefore, when this overfulneſs begins to produce languor and oppreſſion, care ſhould be taken in time to reduce the body to a proper ſtandard, by abridging the food and increaſing the natural diſcharges, uſing more exerciſe, and indulging leſs in ſleep.

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But in oppoſite circumſtances, where the fluids have been exhauſted, we are to attempt the prevention of further waſte by the uſe of ſtrengthening ſtomachics, nouriſhing diet, and indulgence from fatigue of body or mind.

Vitiated fluids are to be conſidered as affected either with the different kinds of general acrimony, or as betraying ſigns of ſome of the ſpecies of morbific matter which give riſe to particular diſeaſes, ſuch as gout, rheumatiſm, calculus, ſcurvy, &c.

During the ſtate of infancy, we may ſometimes obſerve a remarkable acidity, which not only ſhows itſelf in the firſt paſſages, but alſo ſeems to contaminate the general maſs of fluids. As it takes its riſe, however, from weak bowels, our views, when we mean to prevent the ill conſequences, muſt be chiefly directed to ſtrengthen the digeſtive organs, as on their ſoundneſs the preparation of good chyle depends; and hence ſmall doſes of rhubarb and chalybeates (either the natural chalybeate waters mixed with milk, or the *flores martiales* in doſes of a few grains, according to the age of the child), are to be adminiſtered; and the diet is to be ſo regulated as not to add to this acid tendency: briſk exerciſe is likewiſe to be enjoined, with frictions on the ſtomach, belly, and lower extremities.

Where the fluids tend to the putreſcent ſtate, which ſhows itſelf by fetid breath, ſpongineſs, and bleeding of the gums, a bloated look and livid caſt, the diet then ſhould be chiefly of freſh vegetables and ripe fruits, with wine in moderation, briſk exerciſe, and ſtrengthening bitters.

Where acrimony ſhows itſelf by itching eruptions, uncommon thirſt, and fluſhing heats, nothing will anſwer better than ſuch ſulphureous waters as the Harrowgate and Moffat in Britain, or the Lucan and Swadlinbar in Ireland; at the ſame time uſing a courſe of diet that ſhall be neither acrid nor heating.

So far with reſpect to thoſe kinds of morbific matter which do not invariably produce a particular ſpecies of diſeaſe: but there are others of a ſpecific nature, ſome of which are generated in the body ſpontaneouſly, and ſeem to ariſe from errors in diet, or other circumſtances of ill management with reſpect to the animal economy; and hence it is ſometimes poſſible, in ſome degree if not altogether, to prevent the ill conſequences. Thus, there are inſtances where returns of the gout have been prevented by adhering ſtrictly to a milk diet.

The rheumatiſm has alſo been ſometimes warded off by wearing a flannel ſhirt, or by uſing the cold bath without interruption.

Calculus may be retarded in its progreſs, and prevented from creating much diſtreſs, by the internal uſe of ſoap and lime-water, by ſoap-lees taken in milk or in veal-broth, or by the uſe of aerated alkaline water, which may perhaps be conſidered as being both more ſafe and more efficacious, and at the ſame time more pleaſant, than any of the other practices.

The ſcurvy may be prevented by warm clothing and perſeverance in briſk exerciſe, by drinking wine or cyder, and eating freely of ſuch vegetable ſubſtances as can be had in thoſe ſituations where this diſeaſe is moſt apt to ſhow itſelf.

In conſtitutions where there is an hereditary diſpoſition to the ſcrofula, if early precautions be taken to ſtrengthen the ſolids by cold bathing, a nouriſhing courſe of diet, and moderate uſe of wine, the acrimony which gives riſe to the diſeaſe will probably be prevented from producing very bad effects.

The other kinds of morbific matter, which are of the ſpecific nature are received into the body by infection or contagion.

The infection of a putrid fever or dyſentery is beſt prevented by immediately taking an emetic on the firſt attack of the ſickneſs or ſhivering; and if that do not completely anſwer, let a large bliſter be applied between the ſhoulders: by this method the nurſes and other attendants on the ſick in the naval hoſpitals have often been preſerved. As to other infectious morbific matter, we muſt refer to what has already been ſaid when treating of hydrophobia, poiſons, &c.

The ill effects which may ariſe from the different ſpecies of ſaburra, are to be obviated, in general by the prudent adminiſtration of emetics, and carefully abſtaining from ſuch kinds of food as are known to cauſe the accumulation of noxious matters in the firſt paſſages.

Crude vegetables, milk, butter, and other oily ſubſtances, are to be avoided by perſons troubled with a ſourneſs in the ſtomach; briſk exerciſe, eſpecially riding, is to be uſed, and they are to refrain from fermented liquors: the common drink ſhould be pure water; or water with a very little of ſome ardent ſpirit, ſuch as rum or brandy. Seltzer and Vahls water are to be drunk medicinally; and aromatic bitters, infuſions, or tinctures, with the acid elixir of vitriol, from 10 to 20 drops, will be found ſerviceable, in order to ſtrengthen the fibres of the ſtomach, and promote the expulſion of its contents, thereby preventing the too haſty fermentation of the alimentary mixture. In order to procure immediate relief, magneſia alba, or *creta præparata*, will ſeldom fail; the magneſia, as well as the chalk, may be made into lozenges, with a little ſugar and mucilage; and in that form may be carried about and taken occaſionally by people afflicted with the acid ſaburra.

In conſtitutions where there is an exuberance or ſtagnation of bile, and a troubleſome bitterneſs in the mouth, it is neceſſary to keep the bowels always free, by taking occaſionally ſmall doſes of pure aloes, *oleum ricini*, cream of tartar, ſome of the common purging ſalts, or the natural purging waters.

When there is a tendency to the empyreumatic and rancid ſaburra, people ſhould carefully avoid all the various kinds of thoſe oily and high-ſeaſoned things generally termed *made-diſhes* and eat ſparingly of plain meat, without rich ſauces or much gravy; and in theſe caſes the moſt proper drink is pure water.

414 II. Rules *for thoſe who enjoy perfect* Health.

There can be no doubt, that, in general, temperance is the true foundation of health; and yet the ancient phyſicians, as we may ſee in the rules laid down by Celſus did not ſcruple to recommend indulgence now and then, and allowed people to exceed both in eating and drinking: but it is ſafer to proceed to exceſs in drink than in meat: and if the debauch ſhould create any extraordinary or diſtreſſing degree of pain or ſickneſs, and a temporary fever ſhould enſue, there are two ways of ſhaking it off, either to lie in bed and encourage perſpiration, or to get on horſe-back and by briſk exerciſe reſtore the body to its natural ſtate. The choice of theſe two methods muſt always be determined by the peculiar circumſtances of the parties concerned, and from the experience which they may before have had which agrees beſt with them.

If a perſon ſhould commit exceſs in eating, eſpecially on high-ſeaſoned things, with rich ſauces, a draught of cold water, acidulated with vitriolic acid, will take off the ſenſe of weight at the ſtomach, and aſſiſt digeſtion, by moderating and keeping within bounds the alimentary fermentation, and thus preventing the generation of too much flatus. The luxury of ices may be here of real ſervice at the tables of the great, as producing ſimilar effects with the cold water acidulated. Perſons in theſe circumſtances ought not to lay themſelves down to ſleep, but ſhould keep up and exerciſe until they are ſenſible that the ſtomach is unloaded, and that they no longer feel any oppreſſive weight about the præcordia.

If a man be obliged to faſt, he ought, if poſible, during that time, to avoid laborious work: after ſuffering ſevere hunger, people ought not at once to gorge and fill themſelves; nor is it proper, after being overfilled, to enjoin an abſolute faſt: neither is it ſafe to reſt totally immediately after exceſſive labour, nor ſuddenly fall hard to work after having been long without motion: in a word, all changes ſhould be made by gentle degrees; for though the conſtitution of the human body be ſuch that it can bear many alterations and irregularities without much danger, yet, when the tranſitions are extremely ſudden, they cannot fail of producing ſome kind or degree of diſorder.

It is alſo the advice of Celſus to vary the ſcenes of life, and not confine ourſelves to any ſettled rules: but as inaction renders the body weak and liſtleſs, and exerciſe gives vigour and ſtrength, people ſhould never long omit riding, walking, or going abroad in a carriage; fencing, playing at tennis, dancing, or other ſimilar engagements, which afford both exerciſe and amuſement, as each ſhall be found moſt agreeable or convenient, are to be uſed in their turns, according to the circumſtances and tendency to any particular ſpecies of diſeaſe. But when the weakneſs of old age ſhall have rendered the body incapable of all theſe, then dry frictions with the fleſh-bruſh will be extremely requiſite to preſerve health, by accelerating the flow of humours through the ſmalleſt orders of veſſels, and preventing the fluids from ſtagnating too long in the cellular interſtices of the fleſhy parts.

Sleep is the great reſtorer of ſtrength; for, during this time, the nutritious particles appear to be chiefly applied to repair the waſte, and replace thoſe that have been abraded, and waſhed off by the labour and exerciſe of the day; but too much indulgence in ſleep has many inconveniencies, both with reſpect to body and mind, as it blunts the ſenſes, and encourages the fluids to ſtagnate in the cellular membrane; whence corpulency, and its neceſſary conſequences languor and weakneſs.

The proper time for ſleep is the night ſeaſon, when

darkneſs

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darkneſs and ſilence naturally bring it on: therefore day-ſleep in general is not ſo refreſhing; and to ſome people is really diſtreſsful, as creating an unuſual giddineſs and languor, eſpecially in perſons addicted to literary purſuits. Cuſtom, however, frequently renders ſleep in the day neceſſary; and in thoſe conſtitutions where it is found to give real refreſhment, it ought to be indulged.

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With regard to the general regimen of diet, it has always been held as a rule, that the ſofter and milder kinds of aliment are moſt proper for children and younger ſubjects; that grown perſons ſhould eat what is more ſubſtantial; and old people leſſen their quantity of ſolid food, and increaſe that of their drink.

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Medicines ‖ Medicis. MEDICINES, whatever ſubſtances ſerve to reſtore health.—Medicines are either *ſimple* or *compound;* the former being prepared by nature alone; and the latter owing to the induſtry of man, by variouſly mixing the ſimple together. See PHARMACY.

MEDICINES are likewiſe diſtinguiſhed from the manner of uſing them, into *external* and *internal;* and with regard to their effects, they are ſaid to be *emetic*, *cathartic*, *aſtringent*, &c. See *MATERIA Medica.*

Pocket MEDICINES, in ſurgery, thoſe which a ſurgeon ought always to carry about with him, in a box or convenient caſe.

Thoſe, according to Heiſter, are the common digeſtive ointment, and ſome detergent ointment, for cleanſing and digeſting foul ulcers; to which muſt alſo be added a plaſter or two fitted for defence or adheſion, ſince one or other of theſe is almoſt conſtantly wanted. Neither ſhould there be wanting a piece of blue vitriol for the taking down luxuriant fleſh, and to ſtop hemorrhagies: but if vitriol is wanting, burnt alum, red precipitate, the infernal ſtone, or any other corroſive medicine, will ſupply its place in corroſive intentions; and the laſt will alſo ſerve to open abſceſſes, to make iſſues, and perform many other operations of that kind.

With theſe there ſhould always be kept in readineſs alſo a quantity of ſcraped lint, that the ſurgeon may be able to give immediate aſſiſtance to wounded perſons; ſince, if he is unprepared for this, they may eaſily be taken off by an hemorrhagy; a circumſtance which ought alſo to prevail with him to be always provided with ſuitable bandages.

MEDICIS (Coſmo de), called the *Elder*, ſon of John de Medicis, was born at Florence Sept. 1389. Altho' in a private ſtation, he appeared with the ſplendor of the moſt powerful ſovereign; and his fortune, accumulated by ſucceſsful commerce, was ſurpaſſed by the revenue of few princes. He was partial to the ſciences, and liberal to men of genius. His library conſiſted of a vaſt number of books of his own collecting, and he enriched it with many ſcarce and valuable manuſcripts. Baniſhed from his native country by the envy which his riches inſpired, he went to Venice, where he was received with the honours due to a ſovereign prince. His countrymen ſoon perceived their error, and recalled him from baniſhment. For 34 years he was ſupreme judge of the republic; and his advice was ſolicited by the greater part of the cities and ſovereignties of Italy. This great man died Auguſt 1464, in the 75th year of his age, full of happineſs and glory. On his tombſtone he is ſtyled, "*Father of the people, and deliverer of his country.*" Medicis.

MEDICIS (Laurence de), ſtyled the *Great* and the *Father of learning*, was born A. D. 1448. He was the ſon of Peter, the grandſon of Coſmo, and the brother of Julian de Medicis. Theſe two brothers, who were in poſſeſſion of abſolute power at Florence, excited the jealouſy of Ferdinand of Naples and Pope Sextus IV. The firſt hated them, becauſe they had ruined his influence in Florence; and the ſecond, becauſe they oppoſed the advancement of his nephew. It was at their inſtigation that the Pazzi conſpired againſt them. Julian was murdered while he heard maſs April 26th 1478; and Laurence, who was only wounded, was carried back to his houſe in the midſt of the ſhouts and acclamations of the people. Heir to the greater part of his grandfather's virtues, he was, like him, the Mæcenas of his age. It was equally aſtoniſhing (ſays an hiſtorian of that country) and foreign to our manners, to ſee the ſame man engaged in commerce, and ſupporting the burden of the public affairs; converſing with factors, and receiving ambaſſadors; giving ſhows to the people; affording an aſylum to the unfortunate; and adorning his country with many magnificent buildings. He was ſo much beloved by the Florentines, that they appointed him chief magiſtrate of the republic. By his unbounded liberality, he drew to his court a great number of learned men. He ſent John Laſcaris into Greece to recover manuſcripts, with which he enriched his library. He cultivated learning himſelf, and was the author of the following works: 1. *Des Poeſies Italienes*, Venice, 1554, 12mo. 2. *Canzonne à ballo*, 1568, 4to. 3. *La Compagnia del Mantellaccio Beoni*, with the ſonnets of

Burchiello, 1558 or 1568, 8vo. Laurence de Medicis was ſo univerſally admired, that the princes of Europe did him the honour to appeal their differences to his deciſion. It is even reported, that Bajazet emperor of the Turks, to ſhow him a mark of eſteem and regard, cauſed ſearch, for the murderers of his brother Julian in Conſtantinople, and ſent back one of them who had concealed himſelf in that city. Pope Sixtus IV. was the laſt of his enemies; but he oppoſed him with ſo much ability, that he brought him to terms of accommodation. This illuſtrious man died April 9th 1492, aged 44. His reputation was ſullied by his paſſion for women and by his infidelity. His two ſons, Peter who ſucceeded him and who was expelled from Florence in 1494, and John who went by the name of Pope Leo X. were like their father remarkable for their generoſity and their love of learning. Peter died in 1594, leaving Laurence, the laſt male iſſue of this branch. Laurence was the father of Catharine de Medicis, who married Henry II. king of France.

Medicis (John de), on account of his bravery and knowledge in military affairs was ſurnamed the *Invincible*. He was the ſon of John, otherwiſe called *Jourdain*, de Medicis. His only ſon Coſmo I. ſtyled the *Great*, was choſen duke of Florence after the murder of Alexander de Medicis, A. D. 1537. He firſt carried arms under Laurence de Medicis againſt the duke of Urbino, afterwards under Pope Leo X. Upon the death of Leo, he entered into the ſervice of Francis I. which he quitted to follow the fortunes of Francis Sforza duke of Milan. When Francis I. formed an alliance with the pope and the Venetians againſt the emperor, he returned to his ſervice. He was wounded in the knee at Governola, a ſmall town in the Mantuan territory, by a muſket-ball; and being carried to Mantua, he died the 29th of November 1526, aged 28. Brantome relates, that when his leg was to be cut off, and when he was informed that he needed ſome perſon to ſupport him, "Proceed without fear (ſaid he), I need nobody!" and he held the candle himſelf during the operation. This anecdote is alſo mentioned by Varchi. John de Medicis was above the middle ſtature, ſtrong, and nervous. His ſoldiers, to expreſs their affection for him and their concern for his loſs, aſſumed a mourning dreſs and ſtandards, which gave the name of *the black band* to the Tuſcan troops whom he commanded.

Medicis, (Laurence, or Laurenein de), was deſcended from a brother of Coſmo the Great, and affected the name of *popular*. In 1537, he killed Alexander de Medicis, whom Charles V. had made duke of Florence, and who was believed to be the natural ſon of Laurence de Medicis duke of Urbino. He was jealous of Alexander's power, and diſguiſed this jealouſy under the ſpecious pretext of love to his country. He loved men of learning, and cultivated literature. His works are, 1. *Lamenti*, Modena, 12mo. 2. *Accidoſio Commedia*, Florence 1595, 12mo. He died without iſſue.

Medicis, (Hypolitus de), natural ſon of Julian de Medicis and a lady of Urbino, was early remarkable for the brilliancy of his wit and the graces of his perſon. Pope Clement VII. his couſin, made him cardinal in 1529, and ſent him as legate into Germany to the court of Charles V. When that prince went into Italy, Medicis, yielding to his warlike diſpoſition, appeared in the dreſs of an officer, and advanced before the emperor, followed by ſeveral reſpectable gentlemen of the court. Charles, naturally ſuſpicious, and afraid that the legate intended to do him ſome ill offices with the pope, ſent after him and cauſed him to be apprehended. But when he underſtood that it was a mere ſally of humour in the young cardinal, he ſet him at liberty in a few days. The character which Medicis obtained by the happy ſucceſs of this appointment, was of eſſential ſervice to him. He was conſidered as one of the ſupports of the Holy See; and a little before Clement's death, when the corſair Barbaroſſa made a deſcent into Italy to the great terror of Rome, which was only defended by 200 of the pope's guards, Medicis was diſpatched to protect the coaſts from the fury of the barbarians. On his arrival at the place of deſtination, he was fortunate enough to find that Barbaroſſa had withdrawn himſelf at that critical moment; which allowed him to claim the honour of the retreat without expoſing his perſon or his army. When he returned to Rome, he was of great ſervice in the election of Paul III. who nevertheleſs refuſed to make him legate to Ancona, though that office had been promiſed to him in the conclave. Enraged alſo that the pope had beſtowed the principality of Florence on Alexander de Medicis, ſuppoſed to be the natural ſon of Laurence duke of Urbino, he was prompted by his ambition to believe that he might ſucceed to that dignity by the deſtruction of Alexander. He entered into a conſpiracy againſt him, and determined to carry him off by a mine; but the plot was diſcovered before he had accompliſhed his purpoſe. Octavian Zanga, one of his guards, was arreſted as his chief accomplice. Hypolitus de Medicis, apprehenſive for his own ſafety, retired to a caſtle near Trivoli. On his road to Naples, he fell ſick at Itri in the territory of Fondi, and died Auguſt 13th 1535, in his 24th year, not without ſuſpicion of being poiſoned. His houſe was an aſylum for the unfortunate, and frequently for thoſe who were guilty of the blackeſt crimes. It was open to men of all nations; and he was frequently addreſſed in 20 different languages. He had a natural ſon named *Aſdrubal de Medicis*, who was a knight of Malta. This anecdote proves that his manners were more military than eccleſiaſtic. He wore a ſword, and never put on the habit of cardinal except on occaſions of public ceremony. He was wholly devoted to the theatre, hunting, and poetry.

Medicis, (Alexander de), firſt duke of Florence in 1530, was natural ſon of Laurence de Medicis ſurnamed the *Younger*, and nephew of pope Clement VII. He owed his elevation to the intrigues of his uncle and to the arms of Charles V. This prince having made himſelf maſter of Florence after an obſtinate ſiege, conferred the ſovereignty of this city on Alexander, and afterwards gave him in marriage Margaret of Auſtria his natural daughter. According to the terms of capitulation granted to the Florentines, the new duke was to be only hereditary doge, and his authority was tempered by councils; which left them at leaſt a ſhadow of their ancient liberty. But

Alexander, who felt himſelf ſupported by the emperor and the pope, was no ſooner in poſſeſſion of his new dignity, than he began to govern like a tyrant; being guided by no law but his own caprice, indulging the moſt brutal paſſions, and making light of diſhonouring families, and of violating even the aſylum of the cloiſters to gratify his luſt. Among the confidants of his debauchery was a relation of his own, Laurence de Medicis. This young man, who was only 22 years of age, at the inſtigation of Philip Strozzi, a zealous republican, conceived the deſign of aſſaſſinating Alexander, and thereby of delivering his country from oppreſſion. From the moment when he firſt became attached to him, he tried to gain his confidence, for no other reaſon but that he might the better have it in his power to take away his life. A conſiderable time elapſed before he found ſuch an opportunity as he deſired. At length, under pretence of procuring the duke a *tête à tête* with a lady of whom he was deeply enamoured, he brought him alone and unattended into his chamber, and put him under his bed. He went out, under pretence of introducing the object of his paſſion; and returned along with an aſſaſſin by profeſſion, to whom alone he had entruſted his deſign, only to ſtab him. This cruel ſcene happened on the night betwixt the 5th and 6th of January 1537. Alexander was only 26 years of age. The Florentines derived no advantage from this crime of Laurence, for they failed in their attempt to recover their liberty. The party of the Medicis prevailed, and Alexander was ſucceeded by Coſmo; whoſe government, it muſt be confeſſed, was as juſt and moderate, as that of his predeceſſor had been violent and tyrannical. Laurence de Medicis fled to Venice, to ſome of the leaders of the malcontents at Florence, who had taken refuge there; but not thinking himſelf in ſufficient ſecurity, he went to Conſtantinople, whence he returned ſome time after to Venice. He was there aſſaſſinated in 1547, ten years after the duke's murder, by two ſoldiers, one of whom had formerly been in Alexander's guards: And theſe ſoldiers were generous enough to refuſe a conſiderable ſum of money, which was the price put upon his head.

Medicis (Coſmo de), grand duke of Tuſcany, joined Charles V. againſt the French, after trying in vain to continue neutral. As a reward for his ſervices, the emperor added to the duchy of Tuſcany Piombino the iſle of Elba and other ſtates. Coſmo ſoon after received from pope Pius IV. the title of *grand duke;* and had it not been oppoſed by all the princes of Italy, this pontiff, who was entirely devoted to Coſmo, becauſe he had thought proper to acknowledge him to be of his houſe, would, have conferred on him the title of *king*. There never was a more zealous patron of learning. Ambitious of imitating the ſecond Cæſar, he, like him was fond of learned men, kept them near his perſon, and founded for them the univerſity of Piſa. He died in 1574, at the age of 55, after governing with equal wiſdom and glory. In 1562 he inſtituted the military order of St Stephen. His ſon, Francis Mary, who died in 1587, was the father of Mary of Medicis the wife of Henry the Great, and of Ferdinand I. who died in 1608.

MEDIETAS linguæ, in law, ſignifies a jury, or inqueſt impanelled, of which the one half are natives of this land and the other foreigners. This jury is never uſed except when one of the parties in a plea is a ſtranger and the other a denizen. In petit-treaſon, murder and felony, foreigners are allowed this privilege; but not in high-treaſon, becauſe an alien in that caſe ſhall be tried according to the rules of the common law, and not by a *medietas linguæ*. A grand jury ought not in any caſe to be of a *medietas linguæ;* and the perſon that would have the advantage of a trial in this way, is to pray the ſame, otherwiſe it will not be permitted on a challenge of the jurors.

MEDIMNUS, in Grecian antiquity, a meaſure of Capacity. See Measure.

MEDINA-talnari, a famous town of Arabia Petræa, between Arabia Deſerta and Arabia the Happy; celebrated for being the burial-place of Mahomet. It ſtands at a day's journey from the port of Iambo. It is of moderate ſize, ſurrounded by wretched walls, and ſituated in the midſt of a ſandy plain. It belongs to the Scherif of Mecca, although it had of late times a particular ſovereign of the family of Dacii Barkad. At preſent, the government is confided by the Scherif to a vizir, who muſt be taken from the family of the ſovereign. Before Mahomet, this city was called *Iathreb;* but it got the name of *Medinet en Nebbi*, "the City of the Prophet," after Mahomet, being driven from Mecca by the Koreiſchites, had taken refuge there, and paſſed in it the reſt of his days. The tomb of Mahomet at Medina is reſpected by Muſſulmans, but they are under no obligation to viſit it for the purpoſes of devotion. The caravans of Syria and Egypt alone, which on their return from Mecca paſs near Medina, go a little out of their way to ſee the tomb. It ſtands in a corner of the great ſquare, whereas the Kaba is ſituated in the middle of that at Mecca. That the people may not perform ſome ſuperſtitious worſhip to the relics of the prophet, they are prevented from approaching the tomb by grates, through which they may look at it. It conſiſts of a piece of plain maſon-work in the form of a cheſt, without any other monument. The tomb is placed between two others, where the aſhes of the two firſt caliphs repoſe. Although it is not more magnificent than the tombs of the greater part of the founders of moſques, the building that covers it is decorated with a piece of green ſilk ſtuff embroidered with gold, which the pacha of Damaſcus renews every ſeven years. It is guarded by 40 eunuchs, who watch the treaſure ſaid to be depoſited there. It is ſeated in a plain abounding with palm-trees, in E. Long. 39. 53. N. Lat. 25. See *(Hiſtory of) Arabia.*

Medina-Celi, an ancient town of Spain, in Old Caſtile, and capital of a conſiderable duchy of the ſame name; ſeated near the river Xalon, in W. Long. 2. 9. N. Lat. 41. 15.

Medina-de-las-Torres, a very ancient town of Spain, in Eſtramadura, with an old caſtle, and the title of a duchy. It is ſeated on the confines of Andaluſia, at the foot of a mountain near Bajadoz.

Medina-del-Campo, a large rich, and ancient town of Spain, in the kingdom of Leon. The great ſquare is very fine, and adorned with a ſuperb fountain. It is a trading place, enjoys great privileges, and is ſeated in a country abounding with corn and wine. W. Long. 4. 20. Nat. Lat. 41. 22.

Medina-del-rio-Secco, an ancient and rich town of Spain, in the kingdom of Leon, with the title of a duchy ſeated on a plain, where there are fine paſtures. E. Long. 4. 33. N. Lat. 42. 8.

MEDINA (Sir John), a very eminent painter, was ſon of Medina de L'Aſturias, a Spaniſh captain who had ſettled at Bruſſels, where the ſon was born in 1660. He was inſtructed in painting by du Chatel; under whoſe direction he made good progreſs; and applying himſelf to the ſtudy of Rubens, made that eminent maſter his principal model. He painted both hiſtory and portrait; and was held in an extraordinary eſteem by moſt of the princes of Germany, who diſtinguiſhed his merit by ſeveral marks of honour. He married young, and came into England in 1686, where he drew portraits for ſeveral years with great reputation; as he painted thoſe ſubjects with remarkable freedom of touch, a delicate management of tints, and ſtrong reſemblance of the perſons. The earl of Leven encouraged him to go to Scotland, and procured him a ſubſcription of 500 l. worth of buſineſs. He went, carrying a large number of bodies and poſtures, to which he painted heads. He returned to England for a ſhort time; but went back to Scotland, where he died, and was buried in the church-yard of the Greyfriers at Edinburgh in 1711, aged 52. He painted moſt of the Scotch nobility; but was not rich, having 20 children. The portraits of the profeſſors in the ſurgeon's-hall at Edinburgh were painted by him, and are commended. At Wentworth-caſtle is a large piece containing the firſt duke of Argyle and his ſons, the two late dukes John and Archibald, in Roman habits; the ſtyle Italian and ſuperior to moſt modern performers. In ſurgeon's-hall are two ſmall hiſtories by him. The duke of Gordon preſented Sir John Medina's head to the great duke of Tuſcany for his collection of portraits done by the painters themſelves; the duke of Gorden too was drawn by him, with his ſon the marquis of Huntly, and his daughter Lady Jane, in one piece. Medina was knighted by the duke of Queenſberry, lord high commiſſioner; and was the laſt knight made in Scotland before the union. The prints in the octavo edition of Milton were deſigned by him; and he compoſed another ſet for Ovid's Metamorphoſis, but they were never engraved.

MEDINE, an Egyptian piece of money, of iron ſilvered over, and about the ſize of a ſilver threepence.

MEDIOLANUM, an ancient city, the capital of the Inſubres, built by the Gauls on their ſettlement in that part of Italy. A *municipium*, and a place of great ſtrength. The ſeat of the liberal arts; when it had the name of *Novæ Athenæ*. Now *Milan*, capital of the Milaneſe, ſituated on the rivers Olana and Lombro, E. Long. 9. 30. N. Lat. 45. 25.

Mediolanum Aulercorum (anc. geog.), a town of Gallia Celtica, which afterwards took the name of the *Eburovicum Civitas* (Antonine); corrupted to *Civitas Ebroicorum*, and this laſt to *Ebroica*; whence the modern appellation *Evreux*, a city of Normandy. E. Long. 1. 12. N. Lat. 49. 21.

Mediolanum Gagernorum (anc. geog.), a town of Gallia Belgica; now the village *Moyland*, not far from Cologne.

Mediolanum Ordovicum (anc. geog.), a town of Britain, now *Llan Vethlin*, a market-town in Montgomery in Wales.

Mediolanum Santonum (anc. geog.), which afterwards taking the name of the people, was called *Santonica Urbs*; alſo *Santones* and *Santoni*: A town of Aquitain. Now *Saintes*, capital of Saintonge in Guienne, on the river Charente.

MEDIOMATRICI, anciently a territory of Belgica. Now the dioceſe of Metz.

MEDITATION, an act by which we conſider any thing cloſely, or wherein the ſoul is employed in the ſearch or conſideration of any truth. In our religion, it is uſed to ſignify a conſideration of the objects and grand truths of the Chriſtian faith.

Myſtic divines make a great difference between *meditation* and *contemplation*: the former conſiſts in diſcurſive acts of the ſoul, conſidering methodically and with attention the myſteries of faith and the precepts of morality; and is performed by reflections and reaſonings, which leave behind them manifeſt impreſſions on the brain. The pure contemplative have no need of meditation, as ſeeing all things in God at a glance, and without any reflection. When a man, therefore, has once quitted meditation, and is arrived at contemplation, he returns no more; and, according to Alvarez, never reſumes the oar of meditation, except when the wind of contemplation is too weak to fill his ſails.

MEDITERRANEAN, ſomething incloſed within land; or that is remote from the ocean.

Mediterranean is more particularly uſed to ſignify that large ſea which flows between the continents of Europe and Africa, entering by the ſtraits of Gibraltar, and reaching into Aſia, as far as the Euxine Sea and the Palus Mæotis.

The Mediterranean was anciently called the *Grecian Sea* and the *Great Sea*. It is now cantoned out into ſeveral diviſions, which bear ſeveral names. To the weſt of Italy it is called the *Liguſtic* or *Tuſcan Sea*; near Venice, the *Adriatic*; towards Greece, the *Ionic* and *Ægean*; between the Helleſpont and the Boſphorus, the *White Sea*, as being very ſafe; and beyond, the *Black Sea*, its navigation being dangerous.

The Britiſh trade carried on by means of the Mediterranean Sea is of the laſt conſequence to Great Britain; and the permanent preſervation therefore depends on the poſſeſſion of the town and fortification of Gibraltar.

The counterfeiting of Mediterranean paſſes for ſhips to the coaſt of Barbary, &c. or the ſeal of the admiralty office to ſuch paſſes, is felony without benefit of clergy. Stat. 4 Geo, II. c. 18.

MEDITRINALIA, a Roman feſtival in honour of the goddeſs Meditrini, kept on the 30th of September. Both the deity and the feſtival were ſo called a *medendo*, becauſe on this day they began to drink new wine mixed with old by way of medicine. The mixture of wines, on this feſtival, was drank with much form and ſolemn ceremony.

MEDITULLIUM, is uſed by anatomiſts for that ſpungy ſubſtance between the two plates of the *cranium*, and in the interſtices of all laminated bones. See Anatomy. n° 1, 11.

MEDIUM, in logic, the mean or middle term of a ſyllogiſm, being an argument, reaſon or conſideration, for which we affirm or deny any thing; or, it is the cauſe why the greater extreme is affirmed or denied of the leſs in the concluſion.

Medium, in arithmetic, or *arithmetical medium* or *mean*, called in the ſchools *medium rei;* that which is equally diſtant from each extreme, or which exceeds the leſſer extreme as much as it is exceeded by the greater, in reſpect of quantity, not of proportion; thus 9 is a medium betwixt 6 and 12.

Geometrical Medium, called in the ſchools *medium perſonæ*, is that where the ſame ratio is preſerved between the firſt and ſecond as between the ſecond and third terms; or that which exceeds in the ſame ratio or quota of itſelf, as it is exceeded: thus 6 is a geometrical medium between 4 and 9.

Medium, in philoſophy, that ſpace or region thro' which a body in motion paſſes to any point: thus æther is ſuppoſed to be the medium through which the heavenly bodies move; air, the medium wherein bodies move near our earth; water, the medium wherein fiſhes live and move; and glaſs is alſo a medium of light, as it affords it a free paſſage. That denſity or conſiſtency in the parts of the medium, whereby the motion of bodies in it is retarded, is called the *reſiſtance of the medium;* which, together with the force of gravity, is the cauſe of the ceſſation of the motion of projectiles.

Subtile or *Ætherial Medium.* Sir Iſaac Newton conſiders it probable, that, beſide the particular aereal medium, wherein we live and breathe, there is another more univerſal one, which he calls an *ætherial medium;* vaſtly more rare, ſubtile, elaſtic, and active, than air; and by that means freely permeating the pores and interſtices of all other mediums, and diffuſing itſelf through the whole creation; and by the intervention hereof he thinks it is that moſt of the great phenomena of nature are effected. See Æther, Electricity, Fire, &c.

Medium, in optics, any ſubſtance through which light is tranſmitted.

MEDLAR, in botany. See Mespilus.

MEDULLA ossium, or *Marrow of the Bones*. See Anatomy, n° 5.

Medulla cerebri and *cerebelli*, denotes the white ſoft part of the brain and cerebellum, covered on the outſide with the cortical ſubſtance, which is of a more dark or aſhy colour. See Anatomy, n° 131—133.

Medulla oblongata, is the medullary part of the brain and cerebellum, joined in one; the fore-part of it coming from the brain, and the hind-part from the cerebellum. See Anatomy, n° 134.

It lies on the baſis of the ſkull, and is continued thro' the great preforation thereof into the hollow of the vertebræ of the neck, back, and loins; though only ſo much of it retains the name *oblongata* as is included within the ſkull. After its exit thence, it is diſtinguiſhed by the name of *medulla ſpinalis*. *Ibid.* n° 135.

MEDUSA (fab. hiſt.), one of the three Gorgons, daughter of Phorcys and Ceto. She was the only one of the Gorgons who was ſubject to mortality. She is celebrated for her perſonal charms and the beauty of her locks. Neptune became enamoured of her, and obtained her favours in the temple of Minerva. This violation of the ſanctity of the temple provoked Minerva; and ſhe changed the beautiful locks of Meduſa, which had inſpired Neptune's love, into ſerpents, the ſight of which turned the beholders into ſtones: but Perſeus, armed with Mercury's ax with which he killed Argus, cut off Meduſa's head, from whoſe blood ſprang Pegaſus and Chryſaor, together with the innumerable ſerpents that infeſt Africa. The conqueror placed Meduſa's head on the ægis of Minerva, which he had uſed in his expedition; and the head ſtill retained the ſame petrifying powers as before.

Medusa, in zoology, a genus of vermes, belonging to the order of molluſca. The body is gelatinous, roundiſh, and depreſſed; and the mouth is in the centre of the under part of the body. Many ſpecies, on being handled, affect with a nettle-like burning, and excite a redneſs. The ancients, and ſome of the moderns, add that they have an aphrodiſiac property, and in ſeveral languages they are called by an obſcene name. They were known to the Greek and Romans by the names of Πνευμα Θαλασσιος, and *pulmo marinus*, or ſea-lungs. They attributed medicinal virtues to them. Dioſcorides informs us, that, if rubbed freſh on the diſeaſed part, they cured the gout in the feet, and kibed heels. Ælian ſays, that they were depilatory; and, if macerated in vinegar, would take away the beard. Their phoſphoric quality is well known; nor was it overlooked by the ancients. Pliny obſerves, that if rubbed with a ſtick it will appear to burn, and the wood to ſhine all over. The ſame naturaliſt obſerves, that when they ſink to the bottom of the ſea, they portend a continuance of bad weather.

On Plate CCXCIV, are figured ſeveral ſpecimens, viz. 1. The aurita, or aurited meduſa; which appears, as floating on the water, to be a mere lifeleſs lump of jelly. Fig. 3 n° 1. It is of a whitiſh colour, with a caſt of bluiſh grey, and is of an orbiculated figure, elevated into a convexity in the middle on the upper ſide, flat on the under, and furniſhed with a fringe of fine and ſomewhat rigid filaments round the edge, reſembling white hairs: on the under ſurface there are four cavities near the centre, each of an arcuated figure, and ſurrounded with an opaque line, formed of about 24 parallel points or dots: from the very centre of the under ſide there ariſe four crooked appendages, which have each a row of hairy filaments on the exterior edge; and on the upper ſurface there is an appearance of fine veſſels of a pale colour. This ſpecies is frequent, floating on the ſurface of the ſea, or adhering to rocks about our own coaſts; and when the ſun-ſhines on them, they have a very beautiful lucid appearance. It is called by ſome the *ſea nettle*, it being one of thoſe animals that when touched occaſions a very diſagreeable tingling in the hand. 2. The capillata, or capillated meduſa, is a very Ibid. 3. n° 2. ſingular and odd animal: it ſeems a mere lump of a whitiſh ſemi-pellucid jelly; and is as eaſily broken and deſtroyed by a touch as the common jellies brought to our tables: its ſhape is rounded, riſing into a convexity in the middle, where it is therefore thickeſt, and whence it becomes gradually thinner to the ſides: on the under ſide it is plain, and on this there is viſible a rough, or as it were echinated circle, within which there run eight pairs of rays from the centre toward the circumference; and from the centre there ariſe alſo a number of curled appendages, which are ſometimes reddiſh, but more uſually whitiſh, and a vaſt number of ſlender filaments: the edge or the circumference of the body is regularly divided into eight portions, and each of them is emarginated, ſo that on the whole verge there are 16 ſinuſes. This ſpecies is to be met with in vaſt abundance floating on the ſurface of the water about Sheppy iſland in Kent, England, and elſewhere on that coaſt: great quantities of it are deſtroyed by being thrown on ſhore with the waves, whence it has no power of getting off again; and in the open ſeas, many fiſh ſkim near the ſurface, and prey on them. This is the ſpecies called by many authors *pulmo marinus*, on the ſea lungs. 4. The marſupialis, or purſe meduſa, is ſemi-oval, with four tentacula on the edge. It inhabits the Mediterranean. Fig. 3, n° 3.

Ibid. n° 4. 4. The waved meduſa, has the edges waved, with the fangs on the projecting parts; four orifices beneath, between which riſes a ſtem divided into eight large ragged tentacula.

Theſe animals ſwim in large companies in ſearch of food, with their tenatcula in continual motion, with which they ſeize their prey, and convey it to their mouths: they vary in ſize, the largeſt being generally about eight inches in diameter. They vary likewiſe in the number of their tentacula; ſome having only two, others four, ſix, and ſome eight, but they rarely exceed that number. So powerful is their embrace, that whatever prey comes within their reach never eſcapes. They ſubſiſt on inſects, ſmall fiſh, &c.

Mr Banks, in his paſſage from Madeira to Rio de Janeiro, diſcovered a new ſpecies, which, when brought aboard by the caſting net, had the appearance of metal violently heated, and emitted a white light. With theſe animals were taken ſmall crabs of three different ſpecies, altogether new, each of which gave as much light as the glow-worm, though the creature was not ſo large by nine-tenths. Theſe luminous animals are one of the cauſes of that appearance to the ſea which has been mentioned by many navigators, and of which various reaſons have been aſſigned. It appeared to emit flaſhes of light exactly reſembling thoſe of lightning, only not ſo conſiderable, but ſo frequent, that ſometimes eight or ten were viſible at the ſame moment.

MEDWAY, a river of England, riſes in the Weald of Suſſex, and entering Kent near Aſhurſt runs by Tunbridge, and thence continues its courſe towards Maidſtone. It is navigable for large ſhips to Rocheſter bridge, and thence for veſſels and barges to Maidſtone, the tide flowing up to that town. The diſtance between the mouth of this river, where the fort at Sheerneſs is erected, and Rocheſter bridge, is between 16 and 18 miles. In this part of the river, the channel is ſo deep, the banks ſo ſoft, and the reaches ſo ſhort, that it is one of the beſt and ſafeſt harbours in the world; and ſhips of 80 guns ride a-float at low-water, within muſket-ſhot of Rocheſter-bridge. Nor is there a ſingle inſtance upon record, that any of the Britiſh navy ever ſuffered here by ſtorms, exeept in the dreadful tempeſt which happened in November 1703, when the Royal Catharine was driven on ſhore, where ſhe ſunk and was loſt. On the ſhore of this river are two caſtles, one at Upnor, which guards two reaches of the river, and is ſuppoſed to defend all the ſhips which ride above, between that and the bridge; on the other ſide of the river is Gillingham caſtle, built for the ſame purpoſe, and well furniſhed with cannon which commands the river. Beſides theſe, there is a platform of guns at a place called the Swam, and another at Cockham-wood. But the principal fortification on this river is the caſtle at Sheerneſs.

MEEREN, or Meer, (John Vander,) called the *Old*, an eſteemed painter, was born in 1627; but the maſter under whom he learned the art of painting, is not mentioned. His genius directed him to chooſe for his ſubjects ſea-pieces, landſcapes, and views of the ſea and its ſhores; which he painted with great truth, as he had accuſtomed himſelf to ſketch every ſcene after nature. The ſituations of his landſcapes, are agreeably choſen, frequently they are ſolemn, and generally pleaſing. The forms of his trees are eaſy and natural, his diſtances well obſerved, and the whole ſcenery has a ſtriking effect, by a happy oppoſition of his lights and ſhadows. He alſo very often painted battles in ſuch a ſtile as met with approbation; as they ſhowed good compoſition, were touched with ſpirit, and had a great deal of tranſparence in the colouring. But the fault imputable to Vander Meer is, that in ſome of his pictures the back-grounds are a little too blue, and that ſome of his landſcapes have a tint which appears rather too yellowiſh. He died in 1690.

Meeren, or *Meer*. (John Vander), called *De Jonghe*, an eminent landſcape-painter, is ſuppoſed to have been the ſon of the old John Vander Meer, and of whom he learned the firſt rudiments of the art; but being in his youth deprived of his inſtructor before he had made any great progreſs, he became a diſciple of Nicholas Bergham, and was accounted the beſt of thoſe who were educated in the ſchool of that admired maſter. In the manner of his maſter, he painted landſcapes and cattle; and his uſual ſubjects are cottages, with peaſants at their rural occupations and diverſions. It is obſerved of him, that he very rarely introduced cows, horſes, or any other ſpecies of animals, except goats and ſheep; the latter of which are ſo highly finiſhed, that one would imagine the wool might be felt by the ſoftneſs of its appearance. His touch is ſcarce perceptible, and yet the colours are admirably united. He died in 1688. The genuine works of this Vander Meer bear a very high price, and are eſteemed even in Italy, where they are admitted into the beſt collections; but the ſcarcity of them has occaſioned many moderate copies after his works to be paſſed on the undiſcerning for originals.

MEGALE polis, (anc. geog.) dividedly (Ptolemy, Pauſanius); or conjunctly *Megalopolis*. (Strabo): A town of Arcadia, built under the auſpices of Epaminondas; after the battle of Leuctra; many inconſiderable towns being joined together in one great city the better to withſtand the Spartans. It was the greateſt city of Arcadia, according to Strabo.

MAGALESIA, and Megalenses Ludi, feaſts and games in honour of Cybele or Rhea the mother of the gods, kept on the 12th of April by the Romans, and famous for great rejoicings and diverſions of various ſorts. The Galli carried the image of the goddeſs along the city, with ſound of drums and other muſic, in imitation of the noiſe they made to prevent Saturn from hearing the cries of his infant ſon Jupiter, when he was diſpoſed to devour him.

MEGARA (anc. geog.), a noble city, and the capital of the territory of Megaris, which for many years carried on war with the Corinthians and Athenians. It had for ſome time a ſchool of philoſophers, called the *Megarici*, ſucceſſors of Euclid the Socratic, a native of Megara. Their dialect was the Doric; changed from the Attic, which it formerly had been, becauſe of Peleponneſian coloniſts who ſettled there.

Megara was ſituated at a diſtance from the ſea. Its port was called *Niſæa*, from Niſus ſon of Pandion the ſecond, who obtained the Megaris for his portion, when the kingdom of Athens was divided into four lots by his father. He founded the town, which was eighteen ſtadia or two miles and a quarter from the city, but united with it, as the Piræus with Athens, by long walls. It had a temple of Ceres. "The roof (ſays Pauſanias) may be ſuppoſed to have fallen through age." The ſite (as Dr Chandler informs us †) is now covered with rubbiſh, among which are ſtanding ſome ruinous churches. The place has been named from them *Dode Eccleſiais*, "The Twelve Churches;" but the number is reduced to ſeven. The acropolis or citadel, called alſo *Niſæa*, was on a rock by the ſea-ſide. Some pieces of the wall remain, and a modern fortreſs has been erected on it, and alſo on a leſſer rock near it.

The village Megara (continues the Doctor) conſiſts of low mean cottages, pleaſantly ſituated on the ſlope of a brow or eminence indented in the middle. On each ſide of this vale was an acropolis or citadel; one named Caria; the other from Alcathous, the builder of the wall. They related, that he was aſſiſted by Apollo, who laid his harp aſide on a ſtone, which, as Pauſanias teſtifies, if ſtruck with a pebble returned a muſical ſound. An angle of the wall of one citadel is ſeen by a wind-mill. The maſonry is of the ſpecies called Incertum. In 1676 the city-wall was not entirely demoliſhed, but comprehended the two ſummits, on which are ſome churches, with a portion of the plain toward the ſouth. The whole ſite, except the hills, was now green with corn, and marked by many heaps of ſtones, the collected rubbiſh of buildings. A few inſcriptions are found, with pedeſtals fixed in the walls and inverted; and alſo ſome maimed or mutilated ſtatues. One of the former relates to Atticus Herodes, and is on a pedeſtal which ſupported a ſtatue erected to him when conſul, A. D. 143. by the council and people of Megara, in return for his benefactions and good-will toward the city. In the plain behind the ſummits, on one of which was a temple of Minerva, is a large baſin of water, with ſcattered fragments of marble, the remains of a bath or of a fountain, which is recorded as in the city, and remarkable for its ſize and ornaments, and for the number of it columns. The ſpring was named from the local nymphs called Sithnides.

The ſtone of Megara was of a kind not diſcovered any where elſe in Hellas; very white, uncommonly ſoft, and conſiſting entirely of cockle-ſhells. This was chiefly uſed; and, not being durable, may be reckoned among the cauſes of the deſolation at Megara, which is ſo complete, that one ſearches in vain for veſtiges of the many public edifices, temples, and ſepulchres, which once adorned the city.

Megara was engaged in various wars with Athens and Corinth, and experienced many viciſſitudes of fortune. It was the only one of the Greek cities which did not re-flouriſh under their common benefactor Hadrian; and the reaſon aſſigned is, that the avenging anger of the gods purſued the people for their impiety in killing Anthemocritus a herald, who had been ſent to them in the time of Pericles. The Athenian generals were ſworn on his account to invade them twice a-year. Hadrian and Atticus were followed by another friend, whoſe memory is preſerved by an inſcription on a ſtone lying near a church in the village:—"This too is the work of the moſt magnificent count Diogenes ſon of Archelaus, who regarding the Grecian cities as his own family, has beſtowed on that of the Megarenſians one hundred pieces of gold toward the building of their towers, and alſo one hundred and fifty more with two thouſand two hundred feet of marble towards re-edifying the bath; deeming nothing more hononrable than to do good to the Greeks, and to reſtore their cities." This perſon is not quite unnoticed in hiſtory. He was one of the generals employed by the emperor Anaſtaſius on a rebellion in Iſauria. He ſurpriſed the capital Claudiopolis, and ſuſtained a ſiege with great bravery, A. D. 494.

Megara retains its original name. It has been much infeſted by corſairs; and in 1676 the inhabitants were accuſtomed, on ſeing a boat approach in the day time or hearing their dogs bark at night, immediately to ſecrete their effects and run away. The Vaiwode or Turkiſh governor, who reſided in a forſaken tower above the village, was once carried off. It is no wonder, therefore, that Niſæa has been long abandoned. The place was burned by the Venetians in 1687.

MEGARA (anc. geog.) formerly called *Hybla*, a town towards the eaſt coaſt of Sicily; extinct in Srabo's time, though the name Hybla remained on account of the excellence of its honey. It was a colony of Megareans from Greece. *Riſus Megaricus* denotes a hoarſe-laugh.

MEGARIS (anc. geog.), the country of the Megareans, is deſcribed as a rough region, like Attica; the mountain called *Oneian* or the Aſinine, now *Macriplayi* or "the long Mountain," extending through it toward Bœotia and mount Cithæron. It belonged to Ionia or Attica, until it was taken by the Peloponneſians in the reign of Codrus, when a colony of Dorians ſettled in it. This territory had Attica to the eaſt, Bœotia to the north and weſt, and the Iſthmus of Corinth to the ſouth.

MEGARIS, a ſmall iſland in the Tuſcan ſea, joined to Naples by a bridge. Now called *Caſtello dell'Ovo*.

MEGASTHENES, a Greek hiſtorian in the age of Seleucus Nicanor, about 300 years before Chriſt. He wrote about the oriental nations, and particularly the Indians. His hiſtory is often quoted by the ancients. What now paſſes as his compoſition is ſpurious.

MEIGDDO (anc. geog.), a town of Galilee, recited (Joſhua xvii. 11.) among the cities of Manaſſeth, in the tribe of Iſſachar or Aſſer, on the weſt ſide of Jordan. Famous for the defeat of Ahaziah and Joſiah, who periſhed there (2 Kings xxiii. 29.): near it was

† Travels in Greece, 192

an open plain, fit for drawing up an army in battle array. It was ſituated to the north, contrary to its poſition in the common maps. The Canaanites, being tributary to the Iſraelites, dwelt in it, Joſhua xvii.—It was rebuilt by Solomon. 1 Kings ix.

MEIBOMIUS, the name of ſeveral learned Germans.—*John Henry Meibomius* was profeſſor of phyſic at Helmſtadt, where he was born, and at Lubec; he wrote the *Life of Mæcenas*, publiſhed at Leyden in 4to, 1653, with ſeveral other learned works. *Henry*, his ſon, was born at Lubec in 1638; became profeſſor of phyſic at Helmſtadt; and, beſides works in his own profeſſion, publiſhed *Scriptores rerum Germanicarum*, 3 vol. folio, 1688; a very uſeful collection, firſt begun by his father.—*Marcus Meibomius*, of the ſame family, publiſhed a collection of ſeven Greek authors who had written upon ancient muſic, with a Latin verſion by himſelf; dedicated to Queen Chriſtina of Sweden, who invited him to her court. But ſhe engaging him one day to ſing an air of ancient muſic, while ſomebody was ordered to dance to it, the immoderate mirth which this occaſioned in the ſpectators ſo diſguſted him, that he immediately left the court of Sweden. His edition of the Greek mythologiſts, and notes upon Diogenes Laertius in Menage's edition, ſhow him to have been a man of learning; but he ſuffered no little raillery for his attempt to correct the Hebrew text of the Bible, by a kind of metre he fancied he had found out in thoſe ancient writings.

MEISSEN, a conſiderable town of Germany, in the electorate of Saxony, and in the margravate of Miſnia, with a caſtle. It formerly belonged to the biſhop, but is now ſecularized, and the inhabitants are Lutherans. In this place is a famous manufactory of porcelain. E. Long. 13. 33. N. Lat. 51. 15.

MEL, HONEY, in the materia medica. See HONEY.

MELA (Pomponius), an ancient Latin writer, was born in the province of Bætica in Spain, and flouriſhed in the reign of the emperor Claudius. His three books of Coſmography, or *De ſitu orbis*, are written in a conciſe, perſpicuous, and elegant manner; and have been thought worthy of the attention and labours of the ableſt critics. Iſaac Voſſius gave an edition of them in 1658, 4to, with very large and copious notes. To this edition is added, *Julii Honorii oratoris excerptum coſmographiæ*, firſt publiſhed from the manuſcript, and *Æthici coſmographia*. Gronovius afterwards publiſhed another edition with illuſtrations by medals. In his laſt edition are added five books, *De Geographia*, written by ſome later author: by Jornandes, as Fabricius conjectures.

MELÆNE, or BLACK FLUX, in medicine. See MEDICINE, n° 409.

MELALEUCA, in botany; a genus of the polyandria order, belonging to the polydelphia claſs of plants. The calyx is quinquepartite, ſuperior; the corolla pentapetalous; the filaments are very numerous, and collected in ſuch a manner as to form five pencils; there is one ſtyle; the capſule is half-covered with the calyx, formed like a berry, and is trivalved and trilocular.—This plant has already been noticed under the article (miſpelt) MALALEUCA; where alſo, by miſtake, it was ſaid that there is only one ſpecies.—The ſpecies are five, natives of India and the South Sea iſlands. The moſt remarkable ſpecies is the LEUCADENDRON, from a variety of which (the *latifolia*, or broad-leaved leucadendron) the Cajeput oil is obtained: a medicine in very high eſteem among the eaſtern nations, particularly in India. It is ſaid to be obtained by diſtillation from the fruit of the tree. When brought into this country, it is a liquid of a greeniſh colour, of a fragrant but at the ſame time a very peculiar odour, and of a warm pungent taſte. Some authors, however, repreſent this oil as being, when of the beſt quality, a white or colourleſs fluid; and it has been ſaid by the authors of the *Diſpenſatorium Brunſvicenſe*, when prepared in Europe from the ſeeds ſent from India, to be entirely of this appearance. Hitherto the oleum cajeput has been but litte employed either in Britain or on the continent of Europe; but in India it is uſed both internally and externally, and is highly extolled for its medical properties. It is applied externally where a warm and peculiar ſtimulus is requiſite; it is employed for reſtoring vigour after luxations and ſprains, and for eaſing a violent pain in gouty and rheumatic caſes, in tooth-ach, and ſimilar affections; but it has been chiefly celebrated as taken internally, and it is particularly ſaid to operate as a very powerful remedy againſt tympanitic affections.

MELAMPODIUM, a name given to black hellebore. See HELLEBORUS.

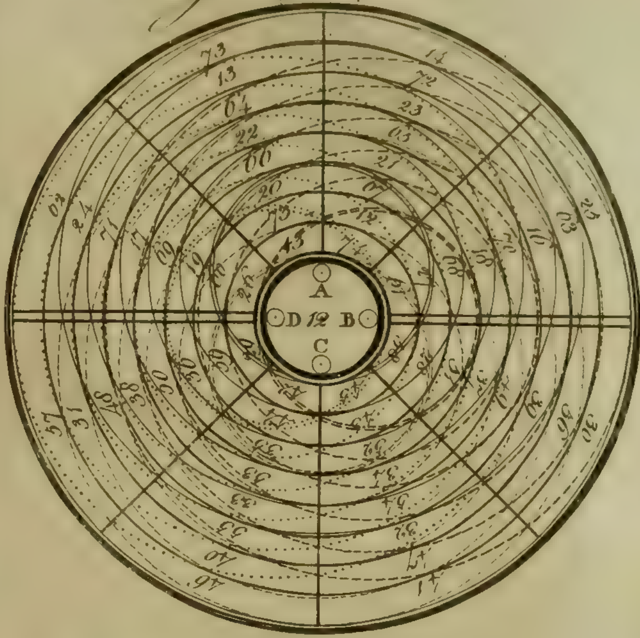
MELAMPODIUM, in botany: A genus of the polygamia neceſſaria order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is paleaceous and conical; the pappus is monophyllous and valve-like; the calyx pentaphyllous.

MELAMPUS (fab. hiſt.), a celebrated ſoothſayer and phyſician of Argos, ſon of Amythaon and Idomenea or Dorippe. He lived at Pylos in Peloponneſus. His ſervants once killed two large ſerpents who had made ther neſts at the bottom of a large oak; and Melampus paid ſo much regard to their remains, that he raiſed a burning pile and burned them upon it. He alſo took particular care of their young ones, and fed them with milk. Some time after this, the young ſerpents crept to Melampus as he ſlept on the graſs near the oak, and, as if ſenſible of the favours of their benefactor, they wantonly played around him, and ſoftly licked his ears. This awoke Melampus, who was aſtoniſhed at the ſudden change which his ſenſes had undergone. He found himſelf acquainted with the chirping of the birds, and with all their rude notes, as they flew around him. He took advantage of this ſupernatural gift, and ſoon made himſelf perfect in the knowledge of futurity, and Apollo alſo inſtructed him in the art of medicine. He had ſoon after the happineſs of curing the daughters of Prœtus, by giving them hellebore, which from that circumſtance has been called *melampodium*; and as a reward for his troubles, he married the eldeſt of theſe princeſſes. The tyranny of his uncle Neleus, king of Pylos, obliged him to leave his native country; and Prœtus, to ſhow himſelf more ſenſible of his ſervices, gave him part of his kingdom. About this time the perſonal charms of Pero, the daughter of Neleus, had gained many admirers; but the father promiſed his daughter only to him who brought into his hands the oxen of Iphiclus. This condition diſpleaſed many; but Bias, who was alſo one of her admirers, Plate CCXCIV.

Magic Square of Squares.

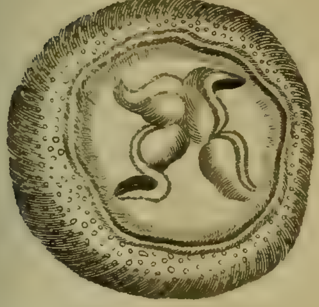
200	217	232	249	8	25	40	57	72	89	104	121	136	153	168	185
58	39	26	7	250	231	218	199	186	167	134	135	122	103	90	71
108	219	230	251	6	27	38	39	70	91	102	123	134	155	166	187
60	37	28	5	252	229	220	197	188	165	156	133	124	101	92	69
201	210	233	248	9	24	41	56	73	88	105	120	137	152	169	184
55	42	23	10	247	234	215	202	183	170	151	138	119	106	87	74
203	214	235	246	11	22	43	54	75	86	107	118	139	150	171	182
53	44	21	12	245	236	213	204	181	172	149	140	117	108	85	76
205	212	237	244	13	20	45	52	77	84	109	116	141	148	173	180
51	46	19	14	243	238	211	206	179	174	147	142	115	110	83	78
207	210	239	242	15	18	47	50	79	82	111	114	143	146	175	178
49	48	17	16	241	240	209	208	177	176	145	144	113	112	81	80
196	221	228	253	4	29	36	61	68	93	100	125	132	157	164	189
62	35	30	3	254	227	222	195	190	163	158	131	126	99	94	67
194	223	226	255	2	31	34	63	66	95	98	127	130	159	162	191
64	33	32	1	256	225	224	193	192	161	160	129	128	97	96	65

Magic Circle of Circles.



Medusa

N.° 1.



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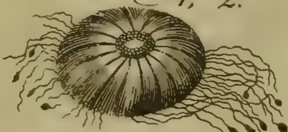
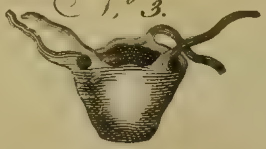


N.° 3.



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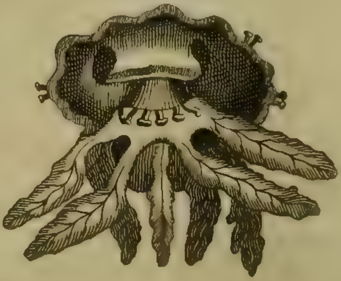
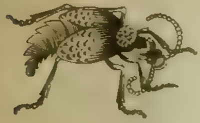
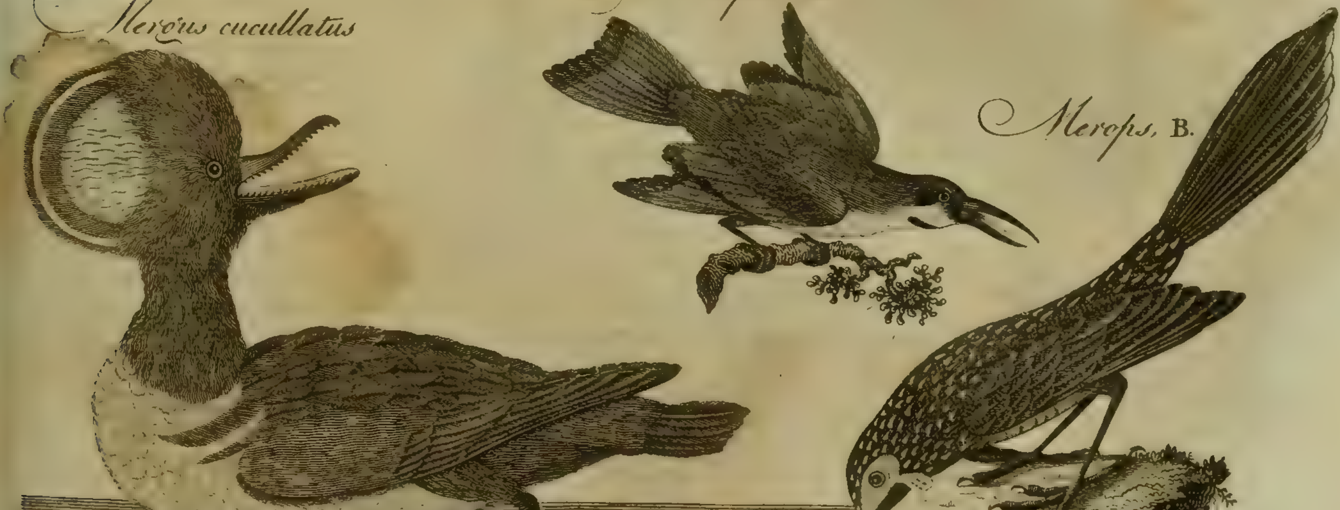


Meloe.





Mergus cucullatus

Merops, A.

Merops, B.

Thackara & Vallance sc.

mirers, engaged his brother Melampus to ſteal the oxen and deliver them to him. Melampus was caught in the attempt, and impriſoned; and nothing but his ſervices as a ſoothſayer and phyſician to Iphiclus would have ſaved him from death. All this pleaded in the favour of Melampus; but when he had taught the childleſs Iphiclus how to become a father, he not only obtained his liberty, but alſo the oxen; and with them he compelled Neleus to give Pero in marriage to Bias. A ſevere diſtemper, which had rendered the women of Argos inſane, was totally removed by Melampus; and Anaxagoras, who then ſat on the throne, rewarded his merit by giving him part of his kingdom, where he eſtabliſhed himſelf, and where his poſterity reigned during ſix ſucceſſive generations. He received divine honours after death, and temples were raiſed to his memory.

MELAMPYRUM, COW-WHEAT: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 40th order, *Perſonatæ*. The calyx is quadrifid; the upper lip of the corolla is compreſſed, with the edges folded back; the capſule is bilocular and oblique, opening at one ſide; there are two gibbous ſeeds. There are four ſpecies, all of them natives of Britain, and growing ſpontaneouſly among corn-fields. They are excellent food for cattle; and Linnæus tells us, that where they abound the yelloweſt and beſt butter is made. Their ſeeds, when mixed with bread, give it a duſky colour; and according to ſome authors, produce a vertigo, and other diſorders of the head; but this is denied by Mr Withering, though he allows that they give it a bitter taſte.

MELANCHOLY, a kind of delirium attended with gloomy thoughts, heavineſs, and ſorrow. See MEDICINE, n° 85, 327.

MELANCTHON (Philip), born at Bretten in the Palatinate in 1495, was one of the wiſeſt and moſt able men of his age among the Reformers, though of a mild temper, and diſpoſed to accommodate rather than to inflame diſputes. In his youth he made an admirable progreſs in learning, and was made Greek profeſſor at Wirtemberg in 1509. Here his lectures upon Homer, and the Greek text of St Paul's Epiſtle to Titus, drew to him a great number of auditors, and entirely effaced the contempt to which his low ſtature and mean appearance had expoſed him. Melancthon reduced the ſciences to ſyſtems; and acquired ſuch reputation, that he had ſometimes 2500 auditors. He ſoon entered into an intimate friendſhip with Luther, who taught divinity in the ſame univerſity; and in 1519 they went together to Leipſic, to diſpute with Eccius. The following years he was continually engaged in various employments; he compoſed ſeveral books; he taught divinity; took ſeveral journeys, in order to found colleges and viſit churches; and in 1530 drew up a confeſſion of faith, which goes by the name of the *Confeſſion of Augſburg*, becauſe it was preſented to the emperor at the diet held in that city. All Europe was convinced, that he was not, like Luther, backward to accommodate the differences between the various ſects of Chriſtians. He hated religious diſputes, and was drawn into them only through the neceſſity of the part he was called to act in the world; and therefore would have ſacrificed many things to have produced an union among the Proteſtants. For this reaſon, Francis I. the French king, wrote to deſire him to come and confer with the doctors of the Sorbonne, in order to agree with them about putting an end to all controverſies; but though Luther endeavoured to perſuade the elector of Saxony to conſent to that journey, and though Melancthon himſelf deſired it, that prince, whether he diſtruſted Melancthon's moderation, or was afraid of quarrelling with the emperor Charles V. would never grant his permiſſion. The king of England alſo in vain deſired to ſee him. Melancthon, in 1529, aſſiſted at the conferences of Spires. In 1541, he was at the famous conferences at Ratiſbon. In 1543, he went to meet the archbiſhop of Cologn to aſſiſt him in introducing the reformation into his dioceſe; but that project came to nothing: and in 1548, he aſſiſted at ſeven conferences on the ſubject of the interim of Charles V. and wrote a cenſure on that interim, and all the writings preſented at theſe conferences. He was extremely affected at the diſſenſions raiſed by Flaccus Illyricus. His laſt conference with thoſe of the Roman communion was at Worms, in 1557. He died at Wittemburg in 1560, and was interred near Luther. Some days before he died, he wrote upon a piece of paper the reaſons which made him look upon death as a happineſs; and the chief of them was, that it "delivered him from theological perſecutions." Nature had given Melancthon a peaceable temper, which was but ill ſuited to the time he was to live in. His moderation ſerved only to be his croſs. He was like a lamb in the midſt of wolves. Nobody liked his mildneſs; it looked as if he was lukewarm; and even Luther himſelf was ſometimes angry at it.

Melancthon was a man in whom many good as well as great qualities were wonderfully united. He had great parts, great learning, great ſweetneſs of temper, moderation, contentedneſs, and the like, which would have made him very happy in any other times but thoſe in which he lived. He never affected dignities, or honours, or riches, but was rather negligent of all theſe things; too much ſo in the opinion of ſome, conſidering he had a family; and his ſon-in-law Sabinus, who was of a more ambitious make, was actually at variance with him upon this very article. Learning was infinitely obliged to him on many accounts; on none more than this, that, as already obſerved, he reduced almoſt all the ſciences which had been taught before in a vague irregular manner, into ſyſtems. Conſidering the diſtractions of his life, and the infinity of diſputes and tumults in which he was engaged, it is aſtoniſhing how he could find leiſure to write ſo many books. Their number is prodigious, inſomuch that it was thought neceſſary to publiſh a chronological catalogue of them in the year 1582. His works indeed are not correct, and he himſelf owned it: but as he found them uſeful, he choſe rather to print a great number, than to finiſh only a few; "which however (as Bayle ſays) was poſtponing his own glory to the advantage of others." His conſtitution was very weak, and required great tenderneſs and management; which made Luther, as hot and zealous as he was, blame him for labouring too earneſtly in the vineyard.

MELANIPPIDES (fab. hiſt.), a Greek poet about 520 years before Chriſt. His grandſon of the ſame name flouriſhed about 60 years after at the court of Perdiccas the Second, of Macedonia. Some fragments of their poetry are ſtill extant.

MELANTERIA, in natural hiſtory, a very beautiful foſſil, of a denſe, compact, and regular texture, and of an extremly bright pale yellow, reſembling nothing ſo much as the pureſt gold. It is remarkably heavy; and is ſometimes found in little irregular maſſes of the bigneſs of a pigeon's egg, which are broken with a ſlight blow: but it is uſually met with in the form of a fine gold-coloured effloreſcence on vitriolic and pyritical bodies; or in looſe, ſhattery, and friable maſſes of a more duſky yellow; in which latter ſtate it ſo much reſembles a native ſulphur, that it is frequently miſtaken for one; however, it is not inflammable; but calcines in the fire to a greyiſh powder, which by burning longer changes to a deep and fine purple.

The Greeks uſed it externally as a gentle eſcharotic and a ſtyptic: they made it an ingredient in their ointments for old ulcers, and uſed to ſprinkle the powder of it on freſh wounds in order to ſtop the hæmorrhagy.

MELASSES. See MOLASSES.

MELASTOMA, the AMERICAN GOOSEBERRY-TREE, in botany. A genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 17th order, *Calycanthemæ*. The calyx is quinquefid and campanulated; the petals are five, inſerted into the calyx; the berry is quinquelocular, and wrapped in the calyx.—There are a great many ſpecies, all of them natives of the warm parts of America, and very beautiful on account of the variegation of their leaves. Moſt of the leaves are of two different colours on their ſurfaces; the under ſide being either white, gold-coloured, or ruſſet, and their upper parts of different ſhades of green; ſo that they make a fine appearance in the hot-houſe all the year round. There are but few of theſe plants in the European gardens; which may perhaps have been occaſioned by the difficulty of bringing over growing plants from the Weſt Indies; and the ſeeds being ſmall when taken out from the pulp of their fruits, rarely ſucceed. The beſt way is to have the entire fruits put up in dry ſand as ſoon as they are ripe, and forwarded by the quickeſt contrivance to England. They ſhould be immediately taken out when they arrive, and the ſeeds ſown in pots of light earth, and plunged into a moderate hot-bed of tanner's bark. When the plants come up, and are fit to be removed, they muſt each be planted in a ſmall pot, and plunged into the tan-bed; and afterwards treated as other exotic plants.

MELCHA, a ſmall village of Barbary, ſituated about 30 miles from the city of Tunis, built on the ruins of CARTHAGE, ſome of which are ſtill viſible.

MELCHITES, in church hiſtory, the name given to the Syriac, Egyptian, and other Chriſtians of the Levant. The Melchites, excepting ſome few points of little or no importance, which relate only to ceremonies and eccleſiaſtical diſcipline, are in every reſpect profeſſed Greeks; but they are governed by a particular patriarch, who reſides at Damas, and aſſumes the title of *patriarch of Antioch*. They celebrate maſs in the Arabian language. The religious among the Melchites follow the rule of St Baſil, the common rule of all the Greek monks. They have four fine convents diſtant about a day's journey from Damas, and never go out of the cloiſter.

MELCHISEDEC, or MELCHIZEDEK, king of Salem, and prieſt of the Moſt High. The ſcripture tells us nothing either of his father, or of his mother, or of his genealogy, or of his birth, or of his death. And in this ſenſe he was a figure of Jeſus Chriſt, as St Paul affirms, who is a prieſt for ever, according to the order of Melchiſedec, and not according to the order of Aaron, whoſe original, life, and death, are known. When Abraham returned from purſuing the four confederate kings who had defeated the kings of Sodom and Gomorrah, and had taken away Lot Abraham's nephew along with them (Gen. xiv. 17, 18, 19, &c.), Melchiſedek came to meet Abraham as far as the valley of Shaveh, which was afterwards named the king's valley, preſented him with the refreſhment of bread and wine (or he offered bread and wine in ſacrifice to the Lord, for he was a prieſt of the moſt high God), and bleſſed him. Abraham being deſirous to acknowledge in him the quality of prieſt of the Lord, offered him the tythes of all he had taken from the enemy. After this time, there is no mention made of the perſon of Melchiſedec; only the Pſalmiſt (cx. 4.) ſpeaking of the Meſſiah, ſays, "Thou art a prieſt for ever after the order of Melchiſedec." St Paul, in his epiſtle to the Hebrews, unfolds the myſtery which is concealed in what is ſaid of Melchiſedec in the Old Teſtament. See Heb. v. 6—10. An infinite number of difficulties and ſcruples have been ſtarted upon the ſubject of Melchiſedec.—St Jerom thought that Salem, of which Melchiſedec was king, was not Jeruſalem, but the city of Salem near Scythopolis, where they ſtill pretended to ſhow the ruins of the palace of this prince. The greatneſs and extent of theſe ruins are a ſufficient proof of the magnificence of this ancient building. He thinks it was at this city of Salem or Shalem, that Jacob arrived after his paſſage over Jordan, at his return from Meſopotamia (Gen. xxxiii. 18.) Some believe that Salem, where Melchiſedec reigned, is the ſame as Salim ſpoken of in the goſpel of St John, chap. iii 23. From the time of Epiphanes there were names invented for the father and mother of Melchiſedec. To his father was given the name of Heraclas or Heracles, and to his mother that of Aſhtaroth or Aſtaria. It is generally agreed on by the learned, that when the apoſtle ſays, he was "without father and without mother," no more is meant, than that he is introduced into the hiſtory of Abraham without acquainting us who he was, or whence he came, where he lived, or when he died. Nevertheleſs, ſome have taken St Paul's words literally, and contended that he was not of human but divine nature. Origen and Didymus took him to be an angel; and the author of the *Queſtions upon the Old and New Teſtament* pretends, that he was the Holy Ghoſt, who appeared to Abraham in a human form. The Arabic Catena, upon the ninth chapter of Geneſis, makes Melchiſedec to be deſcended from Shem by his father, and from Japheth by his mother.

Melchiſedec.

mother. Heraclas or Heraclim his father, was, they ſay, ſon or grandſon of Phaleg, and ſon of Heber; and his mother named Salathiel, was daughter of Gomer ſon of Japheth. Cedrenus and others derive Melchiſedec from an Egyptian ſtock. They ſay his father was called Sidon or Sida, and was the founder of the city of Sidon the capital of Phœnicia. Suidas ſays he was of the curſed race of Canaan; for which reaſon the ſcripture does not mention his genealogy. The Jews and Samaritans believed Melchiſedec to be the ſame with the patriarch Shem; which opinion has been followed by a great number of modern writers. M. Jurieu has undertaken to prove that he is the ſame as Cham or Ham. It would be endleſs to ſet down all the opinions upon this matter: therefore we ſhall only add, that Peter Cunæus and Peter du Moulin have aſſerted, that Melchiſedec who appeared to Abraham was the Son of God, and that the patriarch worſhipped him and acknowledged him for the Meſſiah.

About the beginning of the third century aroſe the hereſy of the Melchiſedecians, who affirmed that Melchiſedec was not a man, but a heavenly power, ſuperior to Jeſus Chriſt: for Melchiſedec, they ſaid, was the interceſſor and mediator of the angels, but Jeſus Chriſt was ſo only for men, and his prieſthood only a copy of that of Melchiſedec, who was the Holy Ghoſt.

We ſhall only beg leave to add here one opinon more concerning Melchiſedec, which is that of the learned Heidegger, who, as the author of the *Hiſt. Patriar*, thinks, has taken the right method of explaining the accounts of Moſes and the apoſtle Paul relating to this extraordinary perſon. He ſuppoſes a twofold Melchiſedec; the one hiſtorical, whereof Moſes gives an account in the xivth chapter of Geneſis, as that he was king as well as high-prieſt of Jeruſalem; the other allegorical, whom St Paul deſcribes, and this allegorical perſon is Jeſus Chriſt.

As the hiſtory of this prince and prieſt is ſo little known, it is no wonder, as Selden obſerves, that many fabulous accounts have been invented of him; of which the following may ſuffice as a ſpecimen. Eutychus patriarch of Alexandria relates, that the body of Adam having been embalmed according to his order, was depoſited in a cave under a mountain of the children of Seth; but that Adam before his death had commanded that they ſhould take away his remains from that place, and tranſport them to the middle of the earth: that Noah, to follow the orders of his anceſtors, had preſerved the bodies of Adam and all the patriarchs with him in the ark: that finding himſelf near his death, he ordered his ſon Shem to take the body of Adam, to furniſh himſelf with bread and wine for his journey, to take with him Melchiſedec the ſon of Phaleg, and to go to the place in which an angel would ſhow them where to bury the firſt man: that Noah added this order, "Command Melchiſedec to fix his reſidence in that place, and to live unmarried all his lifetime, becauſe God has choſen him to do ſervice in his preſence; command him, that he build no temple, nor ſhed the blood of birds, nor four-footed beaſts, or any other animal; and that he offer no other oblations to God but bread and wine." This is the reaſon, according to this author, why Melchiſedec, when he met Abraham, brought forth only bread and wine.

Melchiſedec, Melcomb-regis.

A Greek author, under the name of Athanaſius, relates, that Melchiſedec, was the ſon of an idolatrous king called Melchi and of a queen called Salem.—Melchi, having reſolved to offer a ſacrifice to the gods, ſent his ſon Melchiſedec to fetch him ſeven calves. In the way the young prince was enlightened by God, and immediately returned to his father, to demonſtrate to him the vanity of idols. Melchi, in wrath, ſent him back to fetch the victims. While he was abſent, the king ſacrificed his eldeſt ſon, and a great many other children to his gods. Melchiſedec returning, and conceiving great horror at this butchery, retired to mount Tabor, where he lived ſeven years, without clothes, and fed only on wild fruits. At the end of ſeven years, God appeared to Abraham, bid him go up to mount Tabor, where he ſhould find Melchiſedec. He ordered him to cloath him, and to aſk his bleſſing; which Abraham having done, Melchiſedec anointed him with oil, and they came down together from the mountain.

MELCOMB-REGIS, a town of Dorſetſhire, in England, 130 miles from London, is ſituated at the mouth of the river Wey, by which it is parted from Weymouth. It appears from the name to have been anciently the king's demeſne, and from the records to have paid quit-rent to the crown all along after king Edward I. till it was brought off by the inhabitants before they were united to Weymouth. It lies on the north ſide of the haven, on a peninſula ſurrounded by the ſea on all ſides except on the north. The ſtreets are broad and well paved, and many of the houſes large and high. It ſent members to parliament in the reign of king Edward I. before Weymouth had that privilege. It was by parliament appointed a ſtaple in the reign of Edward III. In the next reign the French burnt it; and it was thereby rendered ſo deſolate, that the remaining inhabitants prayed and obtained a diſcharge from cuſtoms. On account of its quarrels with Weymouth, in the reign of Henry VI. its privileges as a port were removed to Pool: but in that of queen Elizabeth they were reſtored to it by act of parliament, which was confirmed in the next reign, on condition that Melcomb and Weymouth ſhould make but one corporation, and enjoy their privileges in common; and to this was owing the flouriſhing ſtate of both. In the two reigns laſt mentioned, a wooden bridge with ſeventeen arches was built from hence to Weymouth; to which, as well as its church, the chief contributors were certain citizens of London; and upon its decay it was rebuilt in 1770. Here is a good market-place and town-hall, to which the members of the corporation of Weymouth come to attend public buſineſs, as the inhabitants do to its church for public worſhip. For ſeveral years paſt the ſea has retired from it on the eaſt, the priory, formerly being bounded by the ſea; but there is now a ſtreet beyond it, from which it is ſeveral paces to the high-water-mark. The priory was ſituated in the eaſt part of the town, in Maiden-ſtreet, whoſe ſite occupied about an acre, now covered with tenements. On the ſouth ſide are the remains of the chapel, now converted into a malt houſe. Near it are the remains of an ancient building, formerly a nunnery. Here are three meeting-houſes and a work-houſe for the poor. The church, which is in the middle of the town, has a wooden turret for a bell, and had been an old chapel. It was rebuilt in 1605, and made parochial, and is a handſome fabric, with a beautiful altar-piece painted and given by Sir James Thornhill. The port, which generally goes by the name of Weymouth, is ſaid to be the beſt frequented in the county, and is defended by Sandford and Portland caſtles. The markets for both towns are Tueſdays and Fridays, but there are no fairs. Melcomb-regis is reckoned bigger, more thriving, and populous than Weymouth. They are both but one corporation and borough, conſiſting of a mayor, recorder, two bailiffs, an uncertain number of aldermen, and twenty-four capital burgeſſes. Whoever has been a mayor is ever after an alderman. They ſend four burgeſſes to parliament, who are elected by ſuch as have freeholds, whether they inhabit here or not; and the number of voters is near 700. Every elector, as in London, has the privilege of voting for four perſons, who when choſen are returned, in two diſtinct indentures, as the burgeſſes of Weymouth and the burgeſſes of Melcomb-Regis.

MELDÆ (anc. geog.), a town of Gallia Celtica, (called *Meldorum civitas* in the Notitia), on the Matrona. Now *Meaux*, a city in Champaign on the Marne.

MELEAGER (fab. hiſt.) a celebrated hero, ſon of Œneus king of Calydonia, by Althæa daughter of Theſtius. The parcæ were preſent at the moment of his birth, and predicted his future greatneſs. Clotho ſaid that he would be brave and courageous; Lacheſis foretold his uncommon ſtrength and valour; and Atropos ſaid that he ſhould live as long as that firebrand which was on the fire remained entire and unconſumed. Althæa no ſooner heard this, than ſhe ſnatched the ſtick from the fire, and kept it with the moſt jealous care, as the life of her ſon totally depended upon its preſervation. The fame of Meleager increaſed with his years; he ſignalized himſelf in the Argonautic expedition, and afterwards delivered his country from the neighbouring inhabitants, who made war againſt his father at the inſtigation of Diana, whoſe altars Œneus had neglected. But Diana puniſhed the negligence of Œneus by a greater calamity. She ſent a huge wild boar, which laid waſte all the country, and ſeemed invincible on account of its immenſe ſize. It became ſoon a public concern: all the neighbouring princes aſſembled to deſtroy this terrible animal; and nothing is more famous in mythological hiſtory, than the hunting of the Calydonian boar. The princes and chiefs that aſſembled, and which are mentioned by mythologiſts, were Meleager ſon of Œneus, Idas and Lynceus ſons of Apharcus, Dryas ſon of Mars, Caſtor and Pollux ſons of Jupiter and Leda, Pirithous ſon of Ixion, Theſeus ſon of Ægeus, Anceus and Cepheus ſons of Lycurgus, Admetus ſon of Pheres, Jaſon ſon of Æſon, Peleus and Telamon ſons of Æacus, Iphicles ſon of Amphitryon, Eurytrion ſon of Actor, Atalanta daughter of Schœneus, Iolas the friend of Hercules, the ſons of Theſtius, Amphiaraus ſon of Oileus, Protheus, Cometes, the brothers of Altæa, Hippothous ſon of Cercyon, Leucippus, Adraſtus, Ceneus, Phileus, Echion, Lelex, Phœnix ſon of Amyntor, Panopeus, Hyleus, Hippaſus, Neſtor, Menœtius the father of Patroclus, Amphicides, Laertes the father of Ulyſſes, and the four ſons of Hippocoon. This troop of armed men attacked the boar, and it was at laſt killed by Meleager.—The conqueror gave the ſkin and the head to Atalanta, who had firſt wounded the animal. This irritated the reſt, and particularly Toxeus and Plexippus the brothers of Althæa, and they endeavoured to rob Atalanta of the honourable preſent. Meleager defended her, and killed his uncles in the attempt. Mean time the news of this celebrated conqueſt had already reached Calydon, and Althæa went to the temple of the gods to return thanks for the victory which her ſon had gained: But being informed that her brothers had been killed by Meleager, ſhe in the moment of reſentment threw into the fire the fatal ſtick on which her ſon's life depended, and Meleager died as ſoon as it was conſumed. Homer does not mention the firebrand; whence ſome have imagined that this fable is poſterior to that poet's age. But he ſays, that the death of Toxeus and Plexippus ſo irritated Althæa, that ſhe uttered the moſt horrible curſes and imprecations upon her ſon's head.

Meleager, a Greek poet, the ſon of Eucrates, was born at Seleucia in Syria, and flouriſhed under, the reign of Seleucus VI. the laſt king of Syria. He was educated at Tyre; and died in the iſland of Coos, anciently called *Merope*. He there compoſed the Greek epigrams called by us the *Anthologia*. The diſpoſition of the epigrams in this collection was often changed afterwards, and many additions have been made to them. The monk Planudes put them into the order they are are in at preſent, in the year 1380.

MELEAGRIS, in ornithology, the Turky; a genus of birds belonging to the order of gallinæ. The head is covered with ſpongy caruncles; and there is likewiſe a membranaceous longitudinal caruncle on the throat.

There is but one (A) ſpecies, *viz.* the gallopavo, or North American turkey of Ray. It has a caruncle both on the head and throat; and the breaſt of the male is bearded or tufted. He lives upon grain and inſects: when the cock ſtruts, he blows up his breaſt, ſpreads and erects his feathers, relaxes the caruncle on the forehead, and the naked parts of the face and neck become intenſely red. Barbot informs us that very few turkies are to be met with in Guinea, and thoſe only in the hands of the chiefs of the European forts; the negroes declining to breed any on account of their tenderneſs, which ſufficiently proves them not to be natives of that climate. He alſo remarks, that neither the common poultry nor ducks are natural to Guinea any more than the turky. Neither is that bird a native of Aſia: the firſt that were ſeen in Perſia were brought

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(A) Two others were formerly enumerated; but in the late edition of the *Syſt. Nat.* by Gmelin, they have been transferred to a new genus. See Penelope.

brought from Venice by ſome Armenian merchants. They are bred in Ceylon, but not found wild. In fact, the turky, properly ſo called, was unknown to the ancient naturaliſts, and even to the old world, before the diſcovery of America. It was a bird peculiar to the new continent; and is now the commoneſt wild-fowl in the northern parts of that country, where they are frequently met with by hundreds in a flock: in the day-time they frequent the woods, where they feed on acorns; and return at night to the ſwamps to rooſt, which they do on the trees. They are frequently taken by means of dogs, though they run faſter for a time; but the dogs perſiſting in the purſuit, the birds ſoon grow fatigued, and take to the higheſt trees, where they will ſuffer themſelves to be ſhot one after another if within reach of the markſman. This fowl was firſt ſeen in France in the reign of Francis I. and in England in that of Henry VIII. By the date of the reign of theſe monarchs, the firſt turkies muſt have been brought from Mexico, the conqueſt of which was completed A. D. 1521. Ælian mentions a bird found in India, which ſome writers have ſuſpected to be the turky; but Mr Pennant concludes with Geſner, that it was either the peacock, or ſome bird of that genus.

The turky-hen begins to lay early in the ſpring, and will often produce a great number of eggs, which are white, marked with reddiſh or yellow ſpots, or rather freckles. She ſits well, and is careful of her young; of which in this climate ſhe will often have from fourteen to ſeventeen for one brood; but ſhe ſcarce ever ſits more than once in a ſeaſon, except allured thereto by putting freſh eggs under her as ſoon as the firſt ſet are hatched; for as ſhe is a cloſe ſitter ſhe will willingly remain two months on the neſt, tho' this conduct, as may be ſuppoſed, is ſaid greatly to injure the bird. Turkies are bred in quantities in ſome of the northern counties of England, and are driven up to London towards autumn for ſale in flocks of ſeveral hundreds, which are collected from the ſeveral cottages about Norfolk, Suffolk, and neighbouring counties, the inhabitants of which think it well worth their while to attend carefully to them, by making theſe birds a part of their family during the breeding ſeaſon. It is pleaſing to ſee with what facility the drivers manage them, by means of a bit of red rag faſtened to the end of a ſtick, which, from their antipathy to it as a colour, acts with the ſame effect as a ſcourge to a quadruped.

Of the turky there are ſeveral varieties, which have ariſen from domeſtication. The moſt common is *dark grey* inclining to black, or barred duſky white and black. There is alſo a beautiful variety of a fine deep *copper* colour, with the greater quills pure white, and the tail of a dirty white; it is when old a moſt beautiful bird. A variety with a *pure white* plumage is alſo now not unfrequent, and appears very beautiful. It was once eſteemed as a great rarity, and the breed ſuppoſed originally to have ariſen in Holland. In the Leverian Muſeum is alſo a common turky, with a large *tuft* of feathers on its head, much reſembling one figured by Albin.

MELES, in zoology. See Ursus.

Meles (anc. geog.), a fine river running by the walls of Smyrna in Ionia, with a cave at its head, where Homer is ſaid to have written his poems. And from it Homer takes his original name *Meleſigenes*, given him by his mother Critheis, as being born on its banks, (Herodotus.)

MELETIANS, in eccleſiaſtical hiſtory, the name of a conſiderable party who adhered to the cauſe of Meletius biſhop of Lycopolis, in Upper Egypt, after he was depoſed, about the year 306, by Peter biſhop of Alexandria, under the charge of his having ſacrificed to the gods, and having been guilty of other heinous crimes; though Epiphanius makes his only failing to have been an exceſſive ſeverity againſt the lapſed. This diſpute, which was at firſt a perſonal difference between Meletius and Peter, became a religious controverſy; and the Meletian party ſubſiſted in the fifth century, but was condemned by the firſt council of Nice.

MELIA, Azaderach, or the *Bead tree*, in botany: A genus of the monogynia order, belonging to the decandria claſs of plants: and in the natural method ranking under the 23d order *Trihilatæ*. The calyx is quinquedentated: the petals five; the nectarium cylindrical, as long as the corolla, with its mouth ten-toothed: the fruit is a plum with a quinquelocular kernel, There are three ſpecies, all of them exotic trees of the Indies, riſing near 20 feet high; adorned with large pinnated or winged leaves, and cluſters of pentapetalous flowers. They are all propagated by ſeeds ſown on hot-beds.

MELIANTHUS, Honey-flower, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 24th order *Corydales*. The calyx is pentaphyllous, with the lowermoſt leaf gibbous: there are four petals, with the nectarium under the loweſt ones. The capſule is quadrilocular. There are two ſpecies. 1. The major hath a thick, ligneous, ſpreading root; many upright, ligneous, durable ſtalks, riſing ſix or eight feet high; garniſhed with large pinnated leaves, of four or five pair of ſerrated lobes terminated by an odd one; and, from the ſides and tops of the ſtalks, long ſpikes of chocolate-coloured flowers. 2. The minor hath a root like the former; upright, ligneous, ſoft, durable ſtalks, riſing four or five feet high; garniſhed with ſmaller pinnated leaves; and from the ſides and ends of the branches, long, looſe, pendulous bunches of flowers tinged with green, ſaffron colours, and red.—Both the ſpecies flower about, June: but rarely produce ſeeds in this country. They are very ornamental, both in foliage and flower, and merit admittance in every collection. They are eaſily propagated by ſuckers and cuttings. They thrive beſt in a dry ſoil, and in a ſheltered warm expoſure.

MELIBOEA (anc. geog.), an iſland of Syria, at the mouth of the Orontes; which, before it falls into the ſea, forms a ſpreading lake round it. This iſland was famous for its purple dye. Thought to be a colony of Theſſalians; and hence Lucretius's epithet, *Theſſalicus*.

MELICA, ropegrass: A genus of the digynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 4th order *Gramina*. The calyx is bivalved, biflorous, with an embryo of a flower betwixt the two florets. There are three ſpecies; of which the moſt remarkable is the nutans. It is a native of ſeveral parts of Britain, and the adjacent iſlands; and the inhabitants of ſome of the weſtern iſlands make ropes of it for fiſhing-nets, as it will bear the water for a long time without rotting.

MELICERES, in ſurgery, a kind of encyſted tumors, ſo called when their contents are of the conſiſtence of honey.

MELICERTA, Melicertes, or *Melicertus* (fab. hiſt.), a ſon of Athamas and Ino. He was ſaved by his mother from the fury of his father, who prepared to daſh him againſt a wall as he had done his brother Learchus. The mother was ſo terrified that ſhe threw herſelf into the ſea with Melicerta in her arms. Neptune had compaſſion on the misfortunes of Ino and her ſon. He changed them both into ſea deities. Ino was called *Leucothoe* or *Matuta;* and Melicerta was known among the Greeks by the name of *Palæmon,* and among the Latins by that of *Portumnus.* Some ſuppoſe that the Iſthmian games were inſtituted in honour of Melicerta.

MELILLA, an ancient town of Africa in the kingdom of Fez, and in the province of Garet. It was taken by the Spaniards in 1469, but returned back to the Moors. W. Long. 2. 9. N. Lat. 35. 20.

MELILOT. See TRIFOLIUM.

MELINDA, a kingdom on the eaſt coaſt of Africa, ſituated, according to ſome, between the third and fourth degree of ſouth latitude; though there is great diſagreement among geographers as to its extent. It is allowed by all, however, that the coaſts are very dangerous; being full of rocks and ſhelves, and the ſea at ſome ſeaſons very liable to tempeſts. The kingdom of Melinda is for the moſt part rich and fertile; producing almoſt all the neceſſaries of life except wheat and rice, both which are brought thither from Cambaya and other parts; and thoſe who cannot purchaſe them make uſe of potatoes in their ſtead, which are here fine, large, and in great plenty. They likewiſe abound with great variety of fruit-trees, roots, plants, and other eſculents, and with melons of exquiſite taſte. They have alſo great plenty of veniſon, game, oxen, ſheep, hens, geeſe, and other poultry, &c. and one breed of ſheep whoſe tails weigh between 30 and 40 pounds. The capital city is alſo called *Melinda.*

MELINUM, in natural hiſtory, the name of an earth famous in the earlieſt ages of painting, being the only white of the great painters of antiquity; and, according to Pliny's account, one of the three colours with which alone they performed all their works. It is a fine, white, marly earth, of a very compact texture, yet remarkably light; a ſort of texture which muſt render any earth fit for the painter's uſe that is of a proper colour. It is frequently found forming a ſtratum in the earth, lying immediately under the vegetable mould. It is of a very ſmooth but not gloſſy ſurface; is very ſoft to the touch; adheres firmly to the tongue; is eaſily broken between the fingers; and ſtains the ſkin in handling. It melts readily in the mouth, and is perfectly fine; leaving not the leaſt grittineſs between the teeth: thrown into water, it makes a loud bubbling and hiſſing noiſe, and moulders away into a fine powder. It does not ferment with acids; and ſuffers no change in the fire. Theſe are the characters by which the melinum of the ancients is diſtinguiſhed from all other white earths. It is ſtill found in the ſame place from which the painters of old had it, *viz.* The iſle of Milo or Melos, from whence it had its name; and is common in moſt of the adjacent iſlands. It has of late been tried here; but is found not to make ſuch a bright paint as the other ſubſtances now employed. It is not, however, liable, like them, to turn yellow: hence it would ſeem to be worth the conſideration of perſons in the colour-trade; eſpecially as it might be had in any quantities for the carriage.

MELISSA (fab. hiſt.), a daughter of Meliſſus king of Crete, who with her ſiſter Amalthæa fed Jupiter with the milk of goats. She firſt found out the means of collecting honey; whence it has been fabled that ſhe was changed into a bee, as her name is the Greek word for that inſect.

MELISSA, Baum: A genus of the gymnoſpermia order belonging to the didynamia claſs of plants; and in the natural method ranking under the 42d order *Verticillatæ.* The calyx is aired, a little plane above, with the upper lip having its dents nearly of equal height: the upper lip of the corolla is arched and bifid; the under one, with the middle lobe, cordated. There are ſeveral ſpecies; but the moſt remarkable are the following. 1. The officinalis, or common baum, has fibrous perennial roots; many upright, ſquare, branchy, annual ſtalks, riſing two or three feet high: garniſhed with oblong, indented, oppoſite leaves, by pairs, two or three inches long, and half as broad; and from the upper axillas verticillate cluſters of ſmall white flowers upon ſingle footſtalks. There is alſo a kind with variegated leaves. 2. The grandiflora, or Hetrurian calamint, hath fibrous perennial roots and annual ſtalks, riſing about a foot high, garniſhed with oblong, oval, indented, hairy, oppoſite leaves; and from the upper axillas verticillate cluſters of large purple flowers on forked footſtalks. 3. The calamintha, or common calimint of the ſhops, has fibrous perennial roots; upright, ſquare, branchy hairy ſtalks, riſing a foot high; roundiſh, indented, oppoſite leaves; and verticillate cluſters of ſmall bluiſh flowers, on forked footſtalks as long as the flowers. All theſe ſpecies are eaſily propagated by offsets.

Medicinal uſes. The firſt ſpecies, when in perfection, has a pleaſant ſmell, ſomewhat of the lemon kind; and a weak, roughiſh, aromatic taſte. The young ſhoots have the ſtrongeſt flavour: the flowers, and the herb itſelf when old or produced in very rich moiſt ſoils or rainy ſeaſons, are much weaker both in ſmell and taſte. Baum is appropriated, by the writers on the materia medica, to the head, ſtomach, and uterus; and in all diſorders of theſe parts is ſaid to do extraordinary ſervice. So high an opinion have ſome chemiſts entertained of this plant, that they have expected to find in it a medicine which ſhould prolong life beyond the uſual period. The preſent practice, however, holds it in no great eſteem; and ranks it (where it certainly deſerves to be) among the weaker corroborants. Infuſions of the leaves in water ſmell agreeably of the herb, but have not much taſte, though on being inſpiſſated they leave a conſiderable quantity of a bitteriſh auſtere extract. Infuſions of baum do not, like other aromatics, offend the head, as is complained of from ſage, &c. Cold infuſions in water or ſpirit are far better than the cohobated diſtilled water, and are the beſt preparations from the plant. On diſtilling the freſh herb with water, it impregnates the firſt running pretty ſtrongly with its grateful flavour. When large quantities are ſubjected to the operation at once, there ſeparates and riſes to the ſurface of the aqueous fluid a ſmall portion of eſſential oil, which ſome call *ol. Syriæ*, and others *ol. Germanis*. It is of a yellowiſh colour, and of a very fragrant ſmell.

MELISSUS of Samos, a Greek philoſopher, was the ſon of Rhagines and the diſciple of Parmenides; and lived about 440 B. C. He pretended that the univerſe is infinite, immoveable, and without a vacuum. Themiſtocles was among his pupils.

MELITE (anc. geog.), an iſland referred to Africa by Scylax and Ptolemy; but nearer Sicily, and allotted to it by the Romans: commended for its commodious harbours; for a city well built, with artificers of every kind, eſpecially weavers of fine linen; all owing to the Phœnicians the firſt coloniſts. Now *Malta*; remarkable for St Paul's ſhipwreck. See Malta.

Melite, *Melita*, or *Melitina Inſula*; an iſland on the coaſt of Illyricum in the Adriatic. The *Catuli Melitæi* (Pliny) were famous. Now *Melede*, the name of the iſland Samos. See Samos.

Melite (anc. geog.), a town of Ionia, ſtruck out of the number of Ionian towns on account of the arrogance of the people, and Smyrna admitted in lieu of it. The ſituation not ſaid,

MELITENSIS terra, the *Earth of Malta*: an earth of which there are two very different kinds; the one of the genus of boles, the other of the marles. The latter is that known by medicinal authors under this name; the former is the Malta earth now in uſe: but both being brought from the ſame place, are confuſedly called by the ſame name. The Malteſe marle, which is the *terra Melitenſis* of medicinal authors, is a looſe, crumbly, and very light earth, of an unequal and irregular texture; and, when expoſed to the weather, ſoon falls into fine ſoft powder: but when preſerved and dried, it becomes a looſe, light maſs, of a dirty white colour, with a greyiſh caſt: it is rough to the touch, adheres firmly to the tongue, is very eaſily crumbled to powder between the fingers, and ſtains the hands. Thrown into the water, it ſwells, and afterwards moulders away into a fine powder. It ferments very violently with acid menſtruums. Both kinds are found in great abundance in the iſland of Malta, and the latter has been much eſteemed as a remedy againſt the bites of venomous animals. The other has ſupplied its place in the German ſhops; and is uſed there as a cordial, ſudorific, and aſtringent.

MELITO (canonized), biſhop of Sardis in Lydia, in the ſecond century; remarkable for the apology he preſented to the emperor Aurelius, in favour of the Chriſtians; on which Euſebius and the other ancient eccleſiaſtical writers beſtow great praiſes: but that apology and all Melito's other works are loſt.

MELITUS, a Greek orator and poet, the accuſer of Socrates. The Athenians, after the death of Socrates diſcovering the iniquity of the ſentence they had paſſed againſt that great philoſopher, put Melitus to death, 400 B. C.

MELLAN (Claude), an engraver of conſiderable note, was a native of Abbeville in Picardy, and born in 1601. His father was the receiver of the cuſtoms in that town; and he took great care of the education of his ſon. His genius for drawing diſcovering itſelf very early in life, he was ſent to Paris, and placed under the direction of Simon Vouet in order to perfect himſelf in that art, and his ſtudies promiſed ſucceſs; but he was diverted from his application to them by the deſire he had of learning the management of the graver, which he acquired with much facility. From Paris, at the age of ſixteen, he went to Rome; where he engraved a conſiderable number of plates, many of which are held in great eſtimation; particularly thoſe for the Juſtinian Gallery, the portrait of the Marquis Juſtinian, and that of Pope Urban VIII. Returning to France, he married at Paris and ſettled there in 1654. The king of France being made acquainted with his merit, aſſigned him apartments in the Louvre, in the double quality of a painter and an engraver. He acquired a competent fortune, and was greatly eſteemed by all who knew him. He died in 1688, aged 87.

Florent le Comte tells us, "That Charles II. was ſo much pleaſed with his performances, that he invited him to come into England, making him at the ſame time very advantageous offers. But the love of his country (continues that author) prevented his accepting of them."

It is remarked, that moſt of the plates which he engraved at Rome, and before he went thither, are executed in the uſual manner; that is, with parallel ſtrokes, croſſed with ſecond and third ſtrokes, as the depth of the ſhadows might require. But afterwards he adopted a new mode of working with ſingle ſtrokes only, without any ſecond ſtrokes laid upon them; and the ſhadows are expreſſed by the ſame ſtrokes being made ſtronger and brought nearer to each other. The effect which he produced by this method of engraving is ſoft and clear. In ſingle figures and ſmall ſubjects he ſucceeded very happily; but in large compoſitions, where great depth of ſhadow was required, he has failed. His neateſt plates in this ſtyle have an unfiniſhed appearance, by no means ſuitable to large engravings; but at the ſame time a lightneſs exceedingly agreeable when confined to ſmall ones. According to Le Comte, the works of this maſter amount to 342.

MELLER, a lake of Sweden, 80 miles long, and 30 broad; on which ſtands the city of Stockholm.

MELLI, with the country of the Mundingoes, in Africa. The country formerly called *Melli*, now chiefly inhabited by the Mundingoes, who ſtill retain pretty much of the character aſcribed to the people of Melli, lies to the ſouth of the river Gambia; on the weſt it borders on the kingdom of Kabo; on the ſouth it has *Melli*, properly ſo called, and the mountains that part it from Guinea; and on the eaſt it extends to the kingdom of Gago. A great part of this country we are little acquainted with; as is the caſe with regard to moſt of the inland territories of Africa, but towards the ſea-coaſt this country is a little better known.

The firſt place of note we meet with is Kachao, a Portugueſe colony, ſituated on the river of St Domingo, which falls into the ſea about 26 leagues below this town.—About 26 leagues above Kachao, on the ſame ſide of the river, is another trading town called *Ferini*, where, in the months of October and November, one may trade for about half the quantity of wax and ivory which is traded for at Kachao. Here are alſo ſome ſlaves to be bought.—Bet is a village near the mouth of the river Geſves, where moſt of the traders buy rice; which is in a great plenty there, and very good.—Geſves is a village on a river of the ſame name, on which the Portugueſe have a factory. At Geſves one may trade yearly for 250 ſlaves, 80 or 100 quintals of wax, and as many of ivory. Near the mouth of the river of Geſves is a village called *Kurbali*, where there is a conſiderable trade for ſalt; here are alſo ſome ſlaves and ivory. Rio Grânde, or the Great River, runs about 10 or 12 leaves to the ſouth of the river of Geſves. About 80 leagues from the mouth of it is a nation of Negroes, who are good traders in ivory, rice, millet, and ſome ſlaves. They are called *Analons*. Over-againſt the mouth of Rio Grande is a cluſter of iſlands called *Biſſago Iſles*; the moſt conſiderable of which is Caſſagut, being about ſix leagues long and two broad; its ſoil is very good, and produces millet, rice, and all kinds of pulſe, beſides orange and palm-trees, and many others. This iſland, with thoſe of Carache, Canabac, and La Gallina, are the only ones where the Europeans may trade with ſome ſecurity. They trade, however, ſometimes at the other iſlands, but they muſt be extremely cautious; and yet after all their precautions, they will be robbed and murdered if they venture to go aſhore. The river Nunho runs 16 leagues to the ſouth of Rio Grande; it is very conſiderable, and comes from a vaſt diſtance in-land. One may buy here 500 quintals of ivory and 100 ſlaves a-year. Rice grows here admirably well, and is very cheap. There are every-where ſugar-canes which grow naturally; and plants of indigo, which might turn to good account. The trade is carried on here from March till Auguſt. In the river of Sierra Leone, the late Royal African company of England had, in the year 1728, two iſlands; the one, called *York*, a large flat iſland, near three leagues in circumference, in which the company's ſlaves had a good plantation; the reſt of the iſland is covered with wood, among which are ſilk-cotton trees of an unaccountable ſize. The other iſland is *Benſe*, whereon ſtood a regular fort. It was formerly the reſidence of one of the Engliſh chiefs.

MELMOTH (William, Eſq;), a learned and worthy bencher of Lincoln's Inn, was born in 1666. In conjunction with Mr Peere Williams, Mr Melmoth was the publiſher of Vernon's Reports, under an order of the court of chancery. He had once an intention of printing his own Reports; and a ſhort time before his death advertiſed them at the end of thoſe of his coadjutor Peere Williams, as then actually preparing for the preſs. They have, however, not yet made their appearance. But the performance for which he juſtly deſerves to be held in perpetual remembrance is, "The Great Importance of a Religious life;" concerning which it may be mentioned, to the credit of the age, that notwithſtanding many large editions had before been circulated, 42,000 copies of this uſeful treatiſe have been ſold in the laſt 18 years. It is a ſomewhat ſingular circumſtance, that the real author of this moſt admirable treatiſe ſhould never before have been publicly known (it having been commonly attributed to the firſt earl of Egmont, and particularly by Mr Walpole in his Catalogue); which is the more ſurpriſing, as the author is plainly pointed out in the following ſhort character prefixed to the book itſelf; "It may add weight, perhaps, to the reflections contained in the following pages, to inform the reader, that the author's life was one uniform exemplar of thoſe precepts which, with ſo generous a zeal, and ſuch an elegant and affecting ſimplicity of ſtyle, he endeavours to recommend to general practice. He left others to contend for modes of faith, and inflame themſelves and the world with endleſs controverſy: it was the wiſer purpoſe of his more ennobled aim, to act up to thoſe clear rules of conduct which revelation hath graciouſly preſcribed. He poſſeſſed by temper every moral virtue; by religion every Chriſtian grace. He had a humanity that melted at every diſtreſs; a charity which not only thought no evil, but ſuſpected none. He exerciſed his profeſſion with a ſkill and integrity which nothing could equal but the diſintereſted motive that animated his labours, or the amaible modeſty which accompanied all his virtues. He employed his induſtry, not to gratify his own deſires; no man indulged himſelf leſs: not to accumulate uſeleſs wealth; no man more diſdained ſo unworthy a purſuit: it was for the decent advancement of his family, for the generous aſſiſtance of his friends, for the ready relief of the indigent. How often did he exert his diſtinguiſhed abilities, yet refuſe the reward of them, in defence of the widow, the fatherleſs, and him that had none to help him! In a word, few have ever paſſed a more uſeful, not one a more blameleſs life; and his whole time was employed either in doing good or in meditating it. He died on the 6th day of April 1743, and lies buried under the cloiſter of Lincoln's Inn Chapel. MEM. PAT. OPT. MER. FIL. DIC." The ſon, by whom this character is drawn, is William Melmoth, Eſq; the celebrated tranſlator of Pliny and of Cicero's Letters; and author of thoſe which paſs under the name of *Sir Thomas Fitzoſborne*.

MELOCHIA, Jews mallow, in botany: A genus of the pentandria order, belonging to the monodelphia claſs of plants; and in the natural method ranking under the 37th order, *Columniferæ*. The capſule is quinquelocular and monoſpermous. There are ſeveral ſpecies; but the only remarkable one is the olitorius, or common Jews-mallow, which is a native of the warm parts of Aſia and America.—It is an annual plant, which riſes about two feet high, dividing into ſeveral branches, garniſhed with leaves of different ſizes and forms; ſome are ſpear-ſhaped, others are oval, and ſome almoſt heart-ſhaped: they are of a deep green, and ſlightly indented on their edges, having near their baſe two briſly reflexed ſegments. They have very long ſlender footſtalks, eſpecially thoſe which grow on the lower part of the branches. The flower ſits cloſe on the oppoſite ſide of the branches to the leaves, coming out ſingly; they are compoſed of five ſmall yellow petals, and a great number of ſtamina ſurrounding the oblong germen, which is ſituated in the centre of the flower, and afterwards turns to a rough ſwelling capſule two inches long, ending in a point, and having four cells filled with angular greeniſh ſeeds. This ſpecies is cultivated about the city of Aleppo in Syria, and in the Eaſt Indies, as a pot-herb; the Jews boiling the leaves, and eating them with their meat. It is ſuppoſed by Rauwolf to be the *olus Judaicum* of Avicenna, and the *corchorum* of Pliny.

MELODUNUM, (anc. geog.), a town of the Cenones in Gallia Celtica above Luteſia, now *Melun*, in the iſle of France, on the Seine.

MELODY, in muſic, a ſucceſſion of ſounds ranged in ſuch a manner, according to the laws of rhythmus and modulation, that it may form a ſentiment agreeable to the ear. Vocal melody is called *ſinging*, and that which is performed upon inſtruments may be termed *ſymphonic melody*.

The idea of rhythmus neceſſarily enters into that of melody. An air is not an air but in proportion as the laws of meaſure and quantity are obſerved. The ſame ſucceſſion of ſounds is ſuſceptible of as many different characters, as many different kinds of melody, as the various ways by which its emphatic notes and the quantities of thoſe which intervene, may be diverſified; and the change of duration of the notes alone, may diſguiſe that very ſucceſſion in ſuch a manner that it cannot be known. Thus, melody in itſelf is nothing; it is the rhythmus or meaſure which determines it, and there can be no air without time. If then we abſtract meaſure from both, we cannot compare melody with harmony; for to the former it is eſſential, but not at all to the latter.

Melody, according to the manner in which it is conſidered, has a relation to two different principles. When regarded only as agreeable to the proportions of ſound and the rules of modulation, it has its principle in harmony; ſince it is a harmonical analyſis, which exhibits the different gradations of the ſcale, the chords peculiar to each mode, and the laws of modulation, which are the ſole elements that compoſe an air. According to this principle, the whole power of melody is limited to that of pleaſing the ear by agreeable ſounds, as the eye may be pleaſed with an agreeable aſſemblage of ſuitable colours. But when conſidered as an imitative art, by which we may affect the mind with various images, excite different emotions in the heart, inflame or ſoothe the paſſions; by which, in a word, we produce different effects upon our moral faculties, which are not to be effectuated by the influence of external ſenſe alone, we muſt explore another principle for melody: for in our whole internal frame there appears to be no power upon which either harmony alone, or its neceſſary reſults, can ſeize, to affect us in ſuch a manner.

What then is the ſecond principle? It is as much founded on nature as the firſt; but, in order to diſcover its foundation in nature, it will require a more accurate though ſimpler obſervation, and a more exquiſite degree of ſenſibility in the obſerver. This principle is the ſame which varies the tone of the voice, when we ſpeak according as we are intereſted in what we ſay, and according to the different emotions which we feel in expreſſing it. It is the accent of languages which determines the melody of every nation; it is the accent which determines as to employ the emphaſis of ſpeaking while we ſing, and to ſpeak with more or leſs energy according as the language which we uſe is more or leſs accented. That language whoſe accents are the moſt ſenſible ought to produce a more paſſionate and more lively melody; that which has little accentuation, or none at all, can only produce a cold and languid melody, without character and without expreſſion. Theſe are the true principles: in proportion as we depart from them, when we ſpeak of the power of muſic upon the human heart, we ſhall become unintelligible to ourſelves and others, our words will be without meaning.

If muſic does not impreſs the ſoul with images but by melody, if from thence it obtains its whole power, it muſt follow, that all muſical ſounds which are not pleaſing by themſelves alone, however agreeable to harmony they may be, is not an imitative muſic; and being incapable, even with its moſt beautiful chords, either to preſent the images of things, or to excite the finer feelings, very ſoon cloys the ear, and leaves always the heart in cold indifference. It follows likewiſe, that notwithſtanding the parts which harmony has introduced, and which the preſent taſte of muſic ſo wantonly abuſes, wherever two different melodies are heard at the ſame time, they counteract each other, and deſtroy the effects of both, however beautiful each may be when performed alone: from whence it may be judged with what degree of taſte the French compoſers have introduced in their operas the miſerable practice of accompanying one air with another, as well in ſinging, which is the native expreſſion of pathos and ſentiment, as in inſtrumental performances; which is the ſame thing as if whimſical orators ſhould take it in their heads to recite two orations at the ſame time, that the elegance of each might derive more force from the other.

So much for Rouſſeau. The tranſlator, however, has reaſon to fear, that the cauſes by which national melody is diverſified and characteriſed, are more profound and permanent than the mere accentuation of language. This indeed may have great influence in determining the nature of the rhythmus, and the place of emphatic notes; but very little in regulating the nature of the emphaſis and expreſſion themſelves. If Rouſſeau's principle be true in its full extent, he muſt of neceſſity acknowledge, than an air which was never ſet or intended for words, however melodious, cannot be imitative: we muſt likewiſe confeſs that what is imitative in one nation cannot be ſuch in another: nor can it be denied upon his hypotheſis, that the recitative, which is formed upon the mode of ſpeaking, is the moſt forcible of all melodies; which is abſurd. His other obſervations are at once judicious and profound. Though it is impoſſible to exhibit the beauty and variety of harmony by playing the ſame melody at the ſame time upon different keys, admitting thoſe keys to form among themſelves a perfect chord, which will of conſequence preſerve all the ſubſequent notes in the ſame intervals; yet this perfect harmony would by no means be uniformly pleaſing to the ear. We muſt therefore of neceſſity introduce leſs perfect chords to vary and increaſe the pleaſure, and theſe chords in any complex ſyſtem of muſic muſt of neceſſity produce diſſonances. It then becomes the buſineſs of the compoſer to be careful that theſe diſcords may ariſe as naturally from, and return as naturally to, perfect harmany as poſſible. All theſe cauſes muſt inevitably vary the melody of the different parts; but ſtill, amidſt all theſe difficulties, the artiſt ought to be zealous in preſerving the melody of each as homogeneous with the others as poſſible, that the reſult of the whole may be in ſome meaſure uniform. Otherwiſe, by counteracting each other, the parts will reciprocally deſtroy the effects one of another.

MELOE, in zoology; a genus of inſects of the order of coleoptera. The antennæ are jointed, the laſt joint being oval; the breaſt is roundiſh; the elytra are ſoft and flexible; and the head is inflected, and gibbous. The inſects of this genus are divided into two families; one without wings, and having the elytra ſhorter than the abdomen; and the other winged, with elytra ſhorter than the body and wholly covering the wings.—The moſt remarkable ſpecies are,

1. The proſcarabæus: the colour of which is black, but without brightneſs, though intermixed with a ſmall degree of purple, eſpecially towards the under part of the body. Its head, which is large, is dotted; as is the thorax, which is narrower, round, and without a margin. The elytra are as ſoft as leather, ſhagreened, and cover but part of the abdomen. They are, as it were, cut off obliquely, from the inner to the outer part, being ſhorter towards the ſuture, longer on the ſides. There are no wings under the elytra. The abdomen, is large, eſpecially that of the female, in which it far exceeds the elytra.—This inſect makes its abode on the ſide of wet roads and in woods. Its food are inſects, violet leaves, and delicate herbs. There oozes from its body a fat unctuous matter of an agreeable ſmell. The males are leſs than the females,

2. The veſicatorius, or bliſtering meloe, is nine or ten lines in length, of a ſhining green colour mixed with azure. It multiplies greatly. They are ſometimes ſeen flying in ſwarms. A nauſeous ſmell, not unlike that of mice, beſpeaks their approach; which ſcent leads to the diſcovery of them when they are ſought for in order to make a proviſion. When dried, they are ſo light, that 50 ſcarce weigh one dram. They prey upon the leaves of trees and ſhrubs, and in preference take to thoſe of the aſh-tree. The odorous particles exhaled by theſe inſects, are extremely corroſive. Great caution ſhould be uſed in picking them up. People have been known to be ſeized with violent heat of urine, voiding of blood, for having gathered a quantity of them during the heat of the ſun with their hands bare, or for having fallen aſleep under trees where ſwarms of them had ſettled. The copulation of theſe inſects is performed during the moſt intenſe heat of the day.

There are many other ſpecies, differing in ſize, figure, and colour. Nature has apparelled almoſt all of them in a ſplended manner. Green, azure, and gold render them dazzling to the eyes. They are moſt common in the ſouthern parts of the continent. In this genus, as well as in ſome others, the females court and in the act take the place of the males. The females depoſit their eggs in the ground, whence proceed larvæ, which paſs through the ſtate of chryſalids in order to attain to that of meloes.

Uſes. Oil in which inſects of the firſt ſpecies have been infuſed is ſaid to be an excellent topical for wounds and the ſcorpion's ſting. It enters alſo into the compoſition of ſalve for plague ſores. The inſects bruiſed and mixed with oil or honey, Linnæus ſays, are commended as a remedy in the rabies canina.

The *ſecond* ſpecies is the cantharis of the ſhops; which when bruiſed, is univerſally uſed as a bliſtering plaſter. The largeſt and moſt eſteemed of this ſort come from Italy. Cantharides are extremely acrimonious: applied to the ſkin, they firſt inflame, and afterwards excoriate the part, raiſing a more perfect bliſter than any of the vegetable acrids, and occaſioning a more plentiful diſcharge of ſerum. All the bliſtering compoſitions have cantharides for their baſis. The external application of cantharides is often followed by a ſtrangury, accompanied with thirſt and feveriſh heat: this inconvenience may be remedied by ſoft unctuous or mucilaginous liquors liberally drank.

Cantharides taken internally, often occaſion a diſcharge of blood by urine, with exquiſite pain. If the doſe is conſiderable, they ſeem to inflame and exulcerate the whole inteſtinal canal; the ſtools become mucous and purulent; the breath fetid and cadaverous; intenſe pains are felt in the lower belly; the patient faints, grows giddy, raving mad, and dies. All theſe terrible conſequences have ſometimes happened from a few grains. Herman relates, that he has known a quarter of a grain inflame the kidneys, and occaſion bloody urine with violent pain. There are nevertheleſs caſes in which this ſtimulating fly, given in larger doſes, proves not only ſafe, but of ſingular efficacy for the cure of diſeaſes that yield little to medicines of a milder claſs. In cold phlegmatic ſluggiſh habits, where the viſcera are overloaded, and the kidneys and ureters obſtructed with thick viſcid mucous matter, cantharides have excellent effects: here the abounding mucus defends the ſolids from the acrimony of the fly, till it is itſelf expelled; when the medicine ought to be diſcontinued. Groenvelt employed cantharides with great ſucceſs in dropſies, obſtinate ſuppreſſions of urine, and ulcerations of the bladder; giving very conſiderable doſes made into boluſes with camphor; and interpoſing large draughts of emulſions, milk, or other emollient liquids: by this means, the exceſſive irritation, which they would otherwiſe have occaſioned, was in great meaſure prevented. The camphor did not perhaps contribute ſo much to this effect as is generally imagined, ſince it has no ſenſible quality that promiſes any conſiderable abatement of the acrimony of cantharides: nitre would anſwer all that the camphor is ſuppoſed to perform; this, with milk, or emollient mucilaginous liquors, drank in large quantity, are the beſt correctors. Cantharides, in very ſmall doſes, may be given with ſafety alſo in other caſes. Dr Mead obſerves, that the obſtinate gleetings which frequently remain after the cure of venereal maladies, and which rarely yield to balſamic medicines are effectually remedied by cantharides; and that no one remedy is more efficacious in leprous diſorders; in which laſt, proper purgatives are to be occaſionally taken during the uſe of the cantharides. The beſt and ſafeſt preparation of cantharides for theſe purpoſes, is a ſpirituous tincture; and indeed, in all caſes the tincture is far preferable, for internal uſe, to the fly in ſubſtance.

The virtues of cantharides are extracted by rectified ſpirit of wine, proof ſpirit, and water; but do not ariſe in diſtillation. The watery and ſpirituous extracts bliſter as freely as the fly in ſubſtance; whilſt the fly remaining after the ſeveral menſtrua have performed their office, is to the taſte inſipid, and does not in the leaſt bliſter or inflame the ſkin.

MELON, in botany, a ſpecies of CUCUMIS *, in the Linnæan ſyſtem. The female flowers have no ſtamina or ſummits, but have a very large oval germen, ſituated below the flower, which turns to an oval fruit with ſeveral cells, filled with oval, acute-pointed, compreſſed ſeeds, incloſed in a ſoft pulp. There is a great variety of this fruit cultivated in different parts of the world, many of them of no value, ſize being regarded too much in the markets. The *Cantaleupe melon*, ſo called from a place in the neighbourhood of Rome, where this fruit has been long cultivated, and whither it was brought from Armenia, is in the greateſt eſteem among the curious in every part of Europe. Beſides this, there are alſo the *romana*, the *ſuccado*, the *Zatte*, the ſmall *Portugal or dormer*, and the black *Galloway* melons, moſt of which are cultivated for an early crop.

The management and culture of melons in England are as follow; the ſeeds ſhould be procured from good melons, of the ſoundeſt ſort and higheſt flavour, produced, as ſome have adviſed, in a diſtant garden; for if ſown on the place where it was raiſed and ripened, it is very apt to degenerate. This ſeed ſhould be kept three years before it is ſown but not more than ſix; and if it ſhould be ſown at two ſeaſons, or if at three it will be ſtill better: the firſt for the early crop, to be raiſed under frames, ſhould be ſown about the middle of February; the ſecond, to be raiſed in the ſame manner, is to be ſown about the middle of March; and thoſe which are deſigned for hand or bell-glaſſes, or to be covered with oil-papers, ſhould not be ſown till about a week in April.

For thoſe of the firſt ſeaſon, the ſeeds may be ſown on the upper ſide of a cucumber-bed, if there be any; or, a proper quantity of new looſe dung muſt be provided, and thrown on a heap to ferment, and turned over, that it may acquire an equal heat; and the plants muſt be raiſed and managed like cucumbers, until they are planted where they are to remain. The beds or ridges, where the plants are to remain, ſhould be placed in a warm ſituation, ſo that they may be defended from all cold and ſtrong winds, and incloſed in a good reed fence. In preparing the earth for theſe plants, the Dutch and German gardeners form a mixture of a third part of hazel loam, a third part of the ſcouring of ditches and ponds, and the ſame quantity of very rotten dung; which they mix up at leaſt one, and often two years, before they make uſe of it, frequently turning it over, ſo that the parts may be well incorporated; but the compoſt in which Mr Miller has found melon plants to ſucceed beſt in England is two thirds of freſh gentle loam, and one-third of rotten neat's dung; if theſe are mixed together one year before it is wanted, ſo as to have the benefit of a winter's froſt and ſummer's heat, obſerving to turn it over often, and never ſuffering weeds to grow upon it, this will be found equal to any compoſt whatever. Before the plants appear, there ſhould be a quantity of new dung thrown in a heap, allowing about 15 wheelbarrows full to each light; which muſt be turned over two or three times, and in a fortnight it will be fit for uſe; when the trench muſt be dug to receive the dung where the bed is deſigned to be made, which in a dry ground ſhould not be leſs than a foot or foot and a half deep. The frames ſhould then be placed over the bed to keep out the wet; but no earth ſhould be laid upon it for three or four days, till it is found of a proper temperature of heat. When this is the caſe, the earth may be laid upon it, about two inches thick, except in the middle of each light, where the plants are to be placed, which muſt be raiſed into a hill 15 inches high or more, terminating in a flat cone: in two or three days after the earth is put on the bed, it will be of a proper temper to receive the plants; which ſhould be carefully taken up with a trowel, ſo as to preſerve all the fibres of their roots; or if the beds cannot be ready for them in time, ſoon after the third or rough leaf is put out, it will be a good method to put each plant into a ſmall pot while they are young, and theſe may be plunged into the hot-bed where they were raiſed, or in a cucumber-bed, where there is room; and when the bed is ready, the plants may be turned out of the pots with the whole ball of earth to their roots: and this is the beſt method for the Cantaleupe melon. When the plants are placed on the top of the hills, they ſhould be gently watered once or twice, till they have taken good root; and when they are well fixed in the new beds, a greater quantity of earth ſhould be laid on the beds, preſſed down as cloſe as poſſible, and raiſed at leaſt a foot and a half thick upon the dung all over the bed; obſerving alſo to raiſe the frames, that the glaſſes may not be too near the plants leſt the ſun ſhould ſcorch them. When the plants have four leaves, the top of the plants ſhould be pinched off with the finger and thumb, that they may put out lateral branches for producing the fruit; and when two or more of theſe lateral ſhoots are produced, they muſt alſo be pinched to force out more. The management of theſe beds is much the ſame as that of cucumbers, except that melons require more air and very little water. In five or ſix weeks the plants will ſpread over the bed, and reach to the frames, when the alleys between the beds ſhould be dug out; or in caſe of one bed, a trench ſhould be made on each ſide about four feet wide, as low as the bottom of the bed; and hot dung wheeled in for a lining, to the ſame height as the dung of the bed; this ſhould be trodden down cloſe, and covered with the ſame earth that was laid on the bed, to the thickneſs of a foot and a half or more, treading it down as cloſe as poſſible. In this way the bed will be extended to the width of 12 feet, that the roots of the plants may ſpread quite through it; and the beds will alſo require a freſh warmth, which will be of great ſervice in ſetting of the fruit. When the vines have extended ſo as to fill the frames, and want more room, the frames ſhould be raiſed up with bricks about three inches high, to admit the ſhoots of the vines to run out under them. When the fruit appears, the vines ſhould be carefully looked over three times a week; and one ſhould be choſen upon each runner that is ſituated neareſt the ſtem, having the largeſt foot-ſtalk, and appearing to be the ſtrongeſt fruit; then pinch off all the other fruit which may appear upon the ſame runner, and pinch off the end of the runner at the third joint above the fruit; and if the runner is gently pinched at the next joint above the fruit, it will ſtop the ſap and ſet the fruit. There is alſo another method practiſed by ſome gardeners to ſet this fruit, which is the taking off ſome of the male flowers, whoſe farina is juſt ripe and fit for the purpoſe, laying them over the female fruit, and gently ſtriking with the nails the male flowers, to ſhake the farina into the female flowers; whereby they are impregnated, and the fruit will ſoon after ſwell, and manifeſt viſible ſigns of being perfectly ſet; ſo that where the plants are under frames, and the wind excluded from them, which is wanted to convey the farina from the male to the female flowers, this practice may be very neceſſary. The glaſſes of the hot-bed ſhould alſo be raiſed high to admit a large ſhare of air to the plants, otherwiſe the fruit will not ſet; and if the ſeaſon ſhould prove very warm, the glaſſes may be frequently drawn off, eſpecially in an evening, to receive the dews, provided there is little wind ſtirring: but they ſhould not remain off the whole night, leſt the cold ſhould prove too great. When the plants have extended themſelves from under the frames, in cold weather their extremities ſhould be covered every night with mats, and the plants ſhould be watered once in a week in dry warm weather, in the alleys between the beds.

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* See Cucumis.

For thoſe melons that are raiſed under bell or hand-glaſſes, the plants ſhould be raiſed in the manner already directed, and about the latter end of April, in a forward ſeaſon, the beds may be made. For this purpoſe, a ſufficient qantity of hot-dung ſhould be provided allowing eight or nine good wheel-barrows of dung to each glaſs. For one bed extended in length, the trench ſhould be cut out three-one-half feet wide, and of ſuch a length, that the glaſſes may not be placed nearer than four feet to each other: in digging the trench, it ſhould be ſo ſituated, as to allow for the widening of the bed three or four feet on each ſide; the depth muſt depend on the nature of the ſoil; and when there is no danger of the beds being injured by the wet, the lower it is made the better. When the dung prepared as before is laid on the bed, there ſhould be a hill for each plant, one foot and a half high, and the other part need not be covered more than four inches thick; the glaſſes ſhould then be placed over the hills, and in two or three days after the beds are made they will be fit for receiving the plants, which ſhould be removed in the manner already directed. Theſe plants muſt be watered at firſt, to ſettle the earth to their roots, and ſhaded every day, till they have taken new root; and if the nights prove cold, it will be proper to cover the glaſſes with mats, in order to preſerve the warmth of the bed. If ſeveral beds are made, they ſhould be placed at eight feet diſtance from each other. When the plants have taken good root, their tops muſt be pinched off, and the pruning muſt be the ſame as for thoſe under frames. In the day-time, when the weather is warm, the glaſſes ſhould be raiſed on the oppoſite ſide to the wind, to admit freſh air to the plants; and when they reach the ſides of the glaſſes, in favourable weather the glaſſes muſt be ſet up on three bricks, that the vines may have room to run out under them; but when this is done, the beds ſhould be covered all over with earth to the depth of one foot and an half, and trod down as cloſe as poſſible; and in cold nights, the beds ſhould be covered with mats. And as the vines of the Cantaleupe melons cannot bear wet without injury, it will be neceſſary to arch the beds over with props to ſupport the mats, that they may be ready for covering at all times when they require it. If the weather ſhould prove cold, hot dung may be laid to theſe beds in the manner directed for thoſe under frames. Some have lately raiſed their melons with conſiderable ſucceſs under oiled paper; but great care muſt be taken not to keep theſe coverings too cloſe over them. And Miller adviſes to bring up the plants under hand or bell glaſſes, till they begin to extend themſelves under the glaſſes, and then, inſtead of the covering of mats, to put over them the paper done over with linſeed oil.

The farther management of melons, after their fruit is ſet, is to keep pulling off all the ſuperfluous fruit, and to pinch off all weak runners; and alſo to turn the fruit gently twice a-week, that each ſide may have equal benefit of the ſun and air. When the fruit is fully grown, care ſhould be taken to cut it at a proper time; for if it is left a few hours upon the vines, it will loſe much of its delicacy: therefore the vines ſhould be looked over at leaſt twice in a day: and if the fruit intended for the table is cut early in the morning, before the ſun has warmed it, it will be much better flavoured; but if it ſhould be neceſſary to cut any afterwards, it ſhould be put into cold ſpring water or ice to cool it, before it is brought to table; and that cut in the morning ſhould be kept in the cooleſt place till it is uſed. The ſigns of this fruit's maturity is, its beginning to crack near the foot-ſtalk, and its beginning to ſmell, which never fail: but the Cantaleupe melons ſeldom change their colour till they are too ripe.

Mr Reynolds has communicated to the Society of Arts the following method of raiſing melons without earth, dung, or water. About a month before the ſeeds are ſown, he prepares a bed of caſt-off tanner's bark, four feet deep, ſix feet wide, and twelve feet in length: this he covers with four lights, ſo as not to admit rain or water. March (he ſays) is a proper ſeaſon for this purpoſe. When the bed becomes warm, which generally happens in about 20 days, a few melon ſeeds are put into warm milk in an earthen veſſel, which is preſſed down into the bark-bed, where it remains 36 hours, in order to promote the vegetation of the ſeeds. Then, at equal diſtances, he directs to open four holes in the bed, each nine inches in diameter, and five inches deep; having in readineſs about a peck of pounded bark, like ſaw-duſt, ſome of it to be put at the bottom of the holes, to the thickneſs of three inches: on this bark ſome of the ſeeds are to be placed, and preſſed down with the fingers; then the ſeeds are to be covered with two inches more of the powdered bark, preſſing the whole down with the hand. When the plants are advanced to a proper ſize, the beſt are choſen and the others caſt away; thoſe that are reſerved are ordered to be properly pruned, and to have as much warm air as poſſible during the ſummer. In this way (he ſays) he has raiſed as good melons as can be deſired.

When a melon is perfectly fine, it is full without any vacuity: this is known by knocking upon it; and when cut, the fleſh muſt be dry, no water running out, only a litte dew, which is to be of a fine red colour. Large melons are not to be coveted, but firm and well-flavoured ones. Our gardeners who raiſe melons for ſale, ſow the ſeeds of the larger rather than the good kinds, and they increaſe the ſize of theſe by much watering the roots; but this ſpoils the taſte. Some of the French raiſe at this time particularly fine melons, by a method kept as a ſecret, but which we find, on a ſtrict enquiry, is no other than the ingenious Mr Quintiny's of that nation, publiſhed near 80 years ago in the Philoſophical Tranſactions.

The melons particularly proper to be treated in this manner, are thoſe which have a thin and ſomewhat embroidered ſkin, not divided by ribs, and have a red pulp, dry and melting on the tongue, not mealy, and of a high flavour. Theſe are what ſucceed in the following method, and are greatly improved in ſize and flavour by it.

When the ſeeds of this melon are placed in the ground, the firſt thing that appears is a pair of ſeminal leaves, or *ears*, as the gardeners call them. Between theſe two leaves there ſhoots, ſome days after, a leaf called the *firſt leaf* or *knot;* and out of the ſame place, after ſome days more, there ſhoots another leaf, called the *ſecond knot*. Out of the midſt of this ſtalk of the ſecond knot, there ſhoots a third knot; this third knot muſt be cut off at its inſertion, without hurting the branch of the ſecond knot from whence it grows. Out of this place there will grow, after this cutting, a branch, which will be what the gardeners call the *firſt arm;* and this arm will, in the ſame manner as the firſt plant, ſhoot out, firſt one, then a ſecond, and then a third knot; this third knot muſt be cut again as before, and thus the third knots are all along to be cut off, and arms or branches will grow up in the places of them all the way in the ſame manner as the firſt; and it is at thoſe arms that the melons will be produced, and they will be always good, if the foot or root be well nouriſhed in good earth, and cheriſhed by a good hot-bed and the ſun. The foot of the melon muſt never be ſuffered to paſs into the dung, and the earth muſt not be watered but moderately, when it is ſeen to grow too dry; but in this caſe, it muſt be moderately moiſtened in time, leſt the ſhoot ſuffer by it. Twice or thrice a-week is often enough to water in the drieſt weather, and this muſt always be done about ſunſet; and when the heat of the ſun is too violent, the melons muſt be covered with ſtraw mats from 11 in the morning to about two in the afternoon. When it rains much, the melons muſt alſo be covered, leſt it hurt them by too much moiſture. (Philoſoph. Tranſ. n° 45.)—If the root produce too many branches, the weakeſt are to be cut off, and only three or four left; and thoſe which are left are to be ſuch as have their knots cloſeſt to one another. When the plants are removed from the ſeed-bed to the places where they are to ſtand, if they are very ſtrong, they ſhould be planted ſingle; but if otherwiſe, two are to be ſet in each hole.

When they are planted ſingle, the two branches, which always grow on each ſide from the baſe of the ſeed-leaves, are to be left on; but when two plants are ſet together, theſe branches are to be cut off, otherwiſe all the branches will be too numerous, and they will entangle and ſpoil one another.

When the melons are knit, two of them only are to be left upon each foot, chooſing thoſe which are beſt placed, and next to the firſt and principal ſtalk, that is, to the heart of the foot. None but fair fruits are to be left, and ſuch as have a thick and ſhort tail; and the foot of the melon muſt be ſhort, well truſſed, and not far diſtant from the ground. Melons of a long ſtem, and having the ſtalk of the leaf too long and ſlender, are never vigorous. All the ſuperfluous branches muſt be cut off from time to time, as they ſhoot out. There ſometimes ſhoots out a branch more than is here mentioned, between the two ſeed-leaves or ears. If this is ſtrong and vigorous, it is to be kept on, but if weakly, it is beſt to take it off, for it will never bear good fruit.

Water-Melon. See ANGURIA.

MELOS, (anc. geog.), an iſland between Crete and Peloponneſus, about 24 miles from Scyllæum. It is about 60 miles in circumference, and of an oblong figure. It enjoyed its independence for above 700 years before the time of the Peloponneſian war. This iſland was originally peopled by a Lacedæmonian colony, 1116 years before the Chriſtian era. For this reaſon the inhabitants refuſed to join the reſt of the iſlands and the Athenians againſt the Peloponneſians. This refuſal was ſeverely puniſhed. The Athenians took Melos, and put to the ſword all ſuch as were able to bear arms. The women and children were made ſlaves, and the iſland left deſolate. An Athenian colony repeopled it, till Lyſander reconquered it and re-eſtabliſhed the original inhabitants in their poſſeſſions.

MELOTHRIA, in botany: A genus of the monogynia order, belonging to the triandria claſs of plants; and in the natural method ranking under the 34th order, *Cucurbitaceæ*. The calyx is quinquefid; the corolla campanulated and monopetalous; the berry trilocular and monoſpermous. There is only one ſpecies, viz. the pendula, a native of Carolina, Virginia, and alſo many of the American iſlands. The plants ſtrike out roots at every joint, which faſten themſelves into the ground, by which means their ſtalks extend to a great diſtance each way. The flowers are very ſmall, in ſhape like thoſe of the melon, of a pale ſulphur colour. The fruit in the Weſt Indies grows to the ſize of a pea, is of an oval figure, and changes to black when ripe: theſe are by the inhabitants ſometimes pickled when they are green. In Britain the fruit are much ſmaller, and are ſo hidden by the leaves that it is difficult to find them. The plants are too tender to be reared in that country without artificial heat.

MELPOMENE (fab. hiſt.), one of the muſes, daughter of Jupiter and Mnemoſyne. She preſided over tragedy. Horace has addreſſed the fineſt of his odes to her, as to the patroneſs of lyric poetry. She was generally repreſented as a young woman with a ſerious countenance. Her garments were ſplendid; ſhe wore a buſkin, and held a dagger in one hand and in the other a ſceptre and crown.

MELROSE, a town of Scotland, in the county of Selkirk, and on the confines of Tweedſdale, ſeated on the ſouth ſide of the river Tweed; with an ancient abbey now in ruins. W. Long. 2. 32. N. Lat. 55. 32.

This abbey was founded by king David I. in 1136. He peopled it with Ciſtertians brought from Rivale abbey in Yorkſhire, and dedicated it to the Virgin Mary. At the reformation James Douglas was appointed commendator, who took down much of the building, in order to furniſh materials for a large houſe to himſelf, which ſtill remains, and is dated 1590. Nothing is left of the abbey excepting a part of the cloiſter walls elegantly carved; but the ruins of the church are of moſt uncommon beauty. Part is at preſent uſed for divine ſervice, the reſt uncovered; but every part does great honour to the atchitect.—Alexander II. was buried beneath the great altar, and it is alſo the place of interment of the Douglaſes and other potent families.—Its ſituation is extremely pleaſant.

MELT of fishes. In the melt of a living cod there are ſuch numbers of thoſe animalcules ſaid to be found in the ſemen of all male animals, that in a drop of its juice, no larger than a grain of ſand, there are contained more than 10,000 of them; and conſidering how many ſuch quantities there are in the whole melt of one ſuch fiſh, it is not incredible, that there are more animals in one melt of it than there are living men at one time upon the face of the earth. However ſtrange and romantic ſuch a conjecture muſt appear, a ſerious conſideration and calculation will make it appear very plain. An hundred ſuch grains of ſand as thoſe juſt mentioned will make about an inch in length; therefore in a cubic inch there will be a million of ſuch ſands; and if there be 10,000 animals in each of thoſe quantities, there muſt be in the whole 150,000 millions, which is a number vaſtly exceeding that of mankind, even ſuppoſing the whole as populous as Holland.

MELTING cone, in eſſaying, an hollow cone of braſs or caſt iron into which melted metalline ſubſtances are thrown, in order to free them from their ſcoriæ. When a ſmall quantity of matter is melted it will be ſufficient to rub the inſide of the cone with greaſe; but when the quantity is very large, eſpecially if it contains any thing ſulphureous, this caution of tallowing the moulds is not ſufficient. In this caſe the eſſayer has recourſe to a lute reduced to thin pap with water, which effectually prevents any injury to the cone.

MELTON-Moubray, a town of Leiceſterſhire, 108 miles from London. It is a large built place, in a fertile ſoil; with a market on Tueſday, the moſt conſiderable for cattle of any in this part of the iſland. It is almoſt encompaſſed with a little river called the *Eye*, over which it has two fine bridges; and has a large handſome church, with a free-ſchool. Here are frequent horſe-races, and three fairs in the year,

MELVIL (Sir James), deſcended from an honourable Scots family, being the third ſon of the laird of Kaeth, was born about the middle of the 16th century. He went to France very young, in the capacity of page to Queen Mary, then married to the dauphin; and on the death of her huſband, followed her to Scotland, where he was made gentleman of her chamber, and admitted a privy-counſellor. She employed him in her moſt important concerns, till her unhappy confinement in Lochleven, all which he diſcharged with the utmoſt fidelity; and, from his own accounts, there is reaſon to conclude, that, had ſhe taken his advice, ſhe might have avoided many of her misfortunes. When ſhe was priſoner in England, ſhe recommended him ſtrongly to her ſon James; with whom he continued in favour and employment until the death of Queen Elizabath: James would then have taken him to England; but Melvil, now grown old, was deſirous of retiring from buſineſs, and in his retirement he drew up the memoirs of his paſt life for the uſe of his ſon. Theſe Memors were accidentally found in Edinburgh caſtle in the year 1660, though nobody knew how they came to be depoſited there were publiſhed in folio in 1683.

MEMBERS, in anatomy, the exterior parts, ariſing from the trunk or body of an animal, like the boughs from the trunk of a tree.

Member, in architecture, denotes any part of a building; as a frieze, cornice, or the like,

Member, is ſometimes alſo uſed for mouldings.

Member, in grammar, is applied to the parts of a period or ſentence.

Member, is alſo uſed to denote ſome particular order or rank in a ſtate or government; thus we ſay "member of a corporation, member of parliament, member of the council," &c.

MEMBRANE, Membrana, in anatomy, a ſimilar part of animal body; being a thin, white, flexible, expanded ſkin formed of ſeveral ſorts of fibres interwoven together, and ſerving to cover or wrap up certain parts of the body. See anatomy *paſſim*.

MEMEL, ar Memmel; a town of Pruſſia, ſituated on the northern extremety of the Curiſche Haf, an inlet of the ſea about 70 miles in length, which is here joined to the Baltic by a narrow ſtrait.—It is an ill-built town, with narrow dirty ſtreets; but remarkable for its extenſive commerce, being provided with the fineſt harbour in the Baltic. In 1784, 996 ſhips, amongſt which were 500 Engliſh, arrived here. The imports chiefly are, ſalt, iron, and ſalted herrings; the exports, which greatly exceed the imports, are amber, corn, hemp, flax, and particularly timber. An Engliſh conſul reſides here. The trade is daily increaſing, on account of the high duties which the court of Ruſſia has laid on the imports of Riga.

MEMNON (fab. hiſt.), a king of Ethiopia, ſon of Tithonus and Aurora. He came with a body of 10,000 men to aſſiſt his uncle Priam, during the Trojan war. He behaved with great courage, and killed Antillochus, Neſtor's ſon. The aged father challenged the Ethiopian monarch; but Memnon refuſed it on account of the venerable age of Neſtor, and accepted that of Achilles. He was killed in the combat, in the fight of the Grecian and Trojan armies. Aurora prayed Jupiter to grant her ſon ſuch honors as might diſtinguiſh him from other mortals. The god conſented; and immediately a numerous flight of birds iſſued from the burning pile on which the body was laid and dividing themſelves into two ſeparate bodies fought with ſuch fury that above half of them fell down in the fire as victims to appeaſe the means of Memnon.

Theſe birds were called *Memnonides*; and it has been obſerved by ſome of the ancients, that they never failed to return yearly to the tomb of Memnon in Troas, and repeat the ſame bloody engagement in honour of the hero from whom they received their name. The Ethiopians or Egyptians, over whom Memnon reigned, erected a celebrated ſtatue to the honour of their monarch. This ſtatue had the wonderful property of uttering a melodious ſound every day at ſun-riſing like that which was heard at the breaking of the ſtring of a harp when it is wound up. This was effected by the rays of the ſun when they fell upon it. At the ſetting of the ſun, and in the night, the ſound was lugubrious. This is ſupported by the teſtimony of the geographer Strabo, who confeſſes himſelf ignorant whether it proceeded from the baſis of the ſtatue, or the people that were then around it. This celebrated ſtatue was diſmantled by order of Cambyſes when he conquered Egypt; and its ruins ſtill aſtoniſh modern travellers by their grandeur and beauty.

Memnon of Rhodes, one of the generals of Darius king of Perſia, adviſed that prince to lay waſte the country, in order to deprive Alexander the Great's army of ſupport, and afterwards to attack Macedon; but this counſel was diſapproved by Darius's other generals. Memnon behaved at the paſſage of the Granicus like an experienced general. He afterwards defended the city of Miletum with great courage; ſeized the iſlands of Chio and Leſbos; ſpread terror throughout all Greece; and would have put a ſtop to the conqueſts of Alexander, if he had not been prevented by death. Barſina, Memnon's widow, was taken priſoner with Darius's wife, and Alexander had a ſon by her named *Hercules*.

MEMOIRS, in matters of literature, a ſpecies of hiſtory, written by perſons who had ſome ſhare in the tranſactions they relate; anſwering to what the Romans called *Commentarii*.—The journals of the proceedings of a literary ſociety, or a collection of matters tranſacted therein, are likewiſe called *Memoirs*.

MEMORY, a faculty of the mind, which preſents to us ideas or notions of what is paſt, accompanied with a perſuaſion that the things themſelves were formerly real and preſent. What we diſtinctly remember to have perceived, we as firmly believe to have happened, as what is now preſent to our ſenſes.

The opinions of philoſophers concerning the means by which the mind retains the ideas of paſt objects, and how thoſe ideas carry with them evidence of their objects having been actually perceived, ſhall be laid before our readers in another place: (ſee METAPHYSICS Part I. chap. ii.) At preſent we ſhall throw together ſome obſervations on the Memory, which, being of a practical rather than of a ſpeculative nature, cannot be admitted into the article where the nature of the faculty itſelf is diſcuſſed,

"When we remember with little or no effort, it is called *remembrance* ſimply, or *memory*, and ſometimes *paſſive memory*[*]. When we endeavour to remember what does not immediately and (as it were) of itſelf occur, it is called *active memory*, or *recollection*. A ready recollection of our knowledge, at the moment when we have occaſion for it, is a talent of the greateſt importance. The man poſſeſſed of it ſeldom fails to diſtinguiſh himſelf in whatever ſort of buſineſs he may be engaged." It is indeed evident, that when the power of retention is weak, all attempts at eminence of knowledge muſt be vain; for "memory is the primary and fundamental power[†], without which there could be no other intellectual operation. Judgment and ratiocination ſuppoſe ſomething already known, and draw their deciſions only from experience. Imagination ſelects ideas from the treaſures of remembrance, and produces novelty only by varied combinatios. We do not even form conjectures of diſtant, or anticipations of future, events, but by concluding what is poſſible from what is paſt."

Of a faculty ſo important, many rules have been given for the regulation and improvement; of which the firſt is, that he who wiſhes to have a clear and diſtinct remembrance, ſhould be temperate with reſpect to eating, drinking, and ſleep. The memory depends very much upon the ſtate of the brain; and therefore whatever is hurtful the latter, muſt be prejudicial to the former. Too much ſleep cloads the brain, and too little overheats it; therefore either of theſe extremes muſt of courſe hurt the memory, and ought carefully to be avoided. Intemperance of all kinds, and exceſs of paſſion, have the ſame ill effects; ſo that we rarely meet with an intemperate perſon whoſe memory is at once clear and tenacious,

"The livelieſt remembrance is not ſo vivid as the ſenſation that produced it[‡]; and ideas of memory do often, but not always, decay more and more, as the original ſenſation becomes more and more remote in time. Thoſe ſenſations and thoſe thoughts have a chance to be long remembered which are lively at firſt; and thoſe are likely to be moſt lively which are moſt attended to, or which are accompanied with pleaſure or pain, with wonder, ſurpriſe, curioſity, merriment, and other lively paſſions. The art of memory, therefore, is little more than the art of attention. What we wiſh to remember we ſhould attend to, ſo as to underſtand it perfectly, fixing our view particularly upon its importance or ſingular nature, that it may raiſe within us ſome of the paſſions abovementioned. We ſhould alſo diſengage our minds from all other things, that we may attend more effectually to the object which we wiſh to remember. No man will read with much advantage who is not able at pleaſure to evacuate his mind, or who brings not to his author an intellect defecated and pure, neither turbid with care, nor agitated with pleaſure. If the repoſitories of thought are already full, what can they receive? If the mind is employed on the paſt or the future, the book will be held before the eyes in vain.

"It is the practice of many readers, to note in the margin of their books the moſt important paſſages[*], the ſtrongeſt argumeuts, or the brighteſt ſentiments. Thus they load their minds with ſuperfluous attention, repreſs the vehemence of curioſity by uſeleſs deliberation, and by frequent interruption break the current of narration or the chain of reaſon, and at laſt cloſe the volume and forget the paſſages and the marks together. Others are firmly perſuaded, that nothing is certainly remembered but what is tranſcribed; and they, therefore, paſs weeks and months in transferring large quotations to a common place-book. Yet, why any part of a book which can be conſulted at pleaſure ſhould be copied, we are not able to diſcover. The hand has no cloſer correſpondence with the memory than the eye. The act of writing itſelf diſtracts the thoughts; and what is read twice, is commonly better remembered than what is tranſcribed. This method, therefore, conſumes time, without aſſiſting the memory. But to write an abridgement of a good book may ſometimes be a very profitable exerciſe. In general, when we would preſerve the doctrines, ſentiments, or facts, that occur in reading, it will be prudent to lay the book aſide, and put them in writing in our own words. This practice will give accuracy to our knowledge, accuſtom us to recollection, improve us in the uſe of language, and enable us ſo thoroughly to comprehend the thoughts of other men, as to make them in ſome meaſure our own."

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[*] Beattie's Elements of Moral Science.

[†] Idler.

[‡] Beattie's Elements, &c. and Idler.

[*] Elements of Moral Science.

"Our thoughts have for the moſt part a connection [*]; ſo that the thought which is juſt now in the mind, depends partly upon that which went before, and partly ſerves to introduce that which follows.—Hence we remember beſt thoſe things of which the parts are methodically diſpoſed and mutually connected. A regular diſcourſe makes a more laſting impreſſion upon the hearer than a parcel of detached ſentences, and gives to his rational powers a more ſalutary exerciſe; and this may ſhow us the propriety of conducting our ſtudies, and all our affairs, according to a regular plan or method. When this is not done, our thoughts and our buſineſs, eſpecially if in any degree complex, ſoon run into confuſion."

As the mind is not at all times equally diſpoſed for the exerciſe of this faculty, ſuch ſeaſons ſhould be made choice of as are moſt proper for it. The mind is ſeldom fit for attention preſently after meals; and to call off the ſpirits at ſuch times from their proper employment in digeſtion, is apt to cloud the brain, and prejudice the health. Both the mind and body ſhould be eaſy and undiſturbed when we engage in this exerciſe, and therefore retirement is moſt fit for it: and the evening, juſt before we go to reſt, is generally recommended as a very convenient ſeaſon, both for the ſtillneſs of the night, and becauſe the impreſſions will then have a longer time to ſettle before they come to be diſturbed by the acceſſion of others proceeding from external objects; and to call over in the morning what has been committed to the memory over-night, muſt, for the ſame reaſon, be very ſerviceable. For, to review thoſe ideas while they continue freſh upon the mind, and unmixed with any others, muſt neceſſarily imprint them more deeply.

Some ancient writers ſpeak of an artificial memory, and lay down rules for attaining it. Simonides the poet is ſaid firſt to have diſcovered this, or at leaſt to have given the occaſion for it. The ſtory they tell of him is this: Being once at a feaſt, he recited a poem which he had made in honour of the perſon who gave the entertainment. But having (as is uſual in poetry) made a large digreſſion in praiſe of Caſtor and Pollux; when he had repeated the whole poem, his patron would give him but half the ſum he had promiſed, telling him he muſt get the other part from thoſe deities who had an equal ſhare in the honour of his performance. Immediately after, Simonides was told that two young men were without, and muſt needs ſpeak with him. He had ſcarce got out of the houſe, when the room where the company was fell down, killed all the perſons in it, and ſo maſhed the bodies, that, when the rubbiſh was thrown off, they could not be known one from another: upon which Simonides recollecting the place where every one had ſat, by that means diſtinguiſhed them. Hence it came to be obſerved, that to fix a number of places in the mind in a certain order, was a help to the memory: As we find by experience, that, upon returning to places once familiar to us, we not only remember them, but likewiſe many things we both ſaid and did in them. This action therefore of Simonides was afterwards improved into an art; and the nature of it is this: They bid you form in your mind the idea of ſome large place or building, which you may divide into a great number of diſtinct parts, ranged and diſpoſed in a certain order. Theſe you are frequently to revolve in your thoughts, till you are able to run them over one after another without heſitation, beginning at any part. Then you are to impreſs upon your mind as many images of living creatures, or any other ſenſible objects which are moſt likely to affect you, and be ſooneſt revived in your memory. Theſe, like characters in ſhort-hand, or hieroglyphics, muſt ſtand to denote an equal number of other words, which cannot ſo eaſily be remembered. When therefore you have a number of things to commit to memory in a certain order, all that you have to do is, to place theſe images regularly in the ſeveral parts of your building. And thus they tell you, that, by going over ſeveral parts of the building, the images placed in them will be revived in the mind; which of courſe will give you the things or words themſelves in the order you deſire to remember them. The advantage of the images ſeems to be this; that, as they are more like to affect the imagination than the words for which they ſtand, they will for that reaſon be more eaſily remembered. Thus, for inſtance, if the image of a *lion* be made to ſignify *ſtrength*, and this word *ſtrength* be one of thoſe I am to remember, and is placed in the porch; when, in going over the ſeveral parts of the building, I come to the porch, I ſhall ſooner be reminded of that image than of the word *ſtrength*. Of this artificial memory, both Cicero and Quintilian ſpeak; but we know not of any modern orator that has ever made uſe of it. It ſeems indeed to have been a laborious way of improving the memory, if it ſerves that end at all, and fitter for aſſiſting us to remember any number of unconnected words than a continual diſcourſe, unleſs ſo far as the remembrance of one word may enable us to recollect more. It is, however, in alluſion to it, that we ſtill call the parts of a diſcourſe *places* or *topics*, and ſay, *in the firſt place*, *in the ſecond place*, &c.

But, doubtleſs, the moſt effectual way to gain a good memory, is by conſtant and moderate exerciſe of it; for the memory, like other habits, is ſtrengthened and improved by daily uſe. It is indeed hardly credible, to what a degree both active and paſſive remembrance may be improved by long practice. *Scaliger* reports of himſelf, that in his youth he could repeat above 100 verſes, having once read them; and *Berthicus* declares, that he wrote his *Comment upon Claudian* without conſulting the text. To hope, however, for ſuch degrees of memory as theſe, would be equally vain as to hope for the ſtrength of *Hercules*, or the ſwiftneſs of *Achilles*. "But there are clergymen who can get a ſermon by heart § in two hours, though their memory, when they began to exerciſe it, was rather weak than ſtrong: And pleaders, with other orators who ſpeak in public and *extempore*, often diſcover, in calling inſtantly to mind all the knowledge neceſſary on the preſent occaſion, and every thing of importance that may have been advanced in the courſe of a long debate, ſuch powers of retention and recollection as, to the man who has never been obliged to exert himſelf in the ſame manner, are altogether aſtoniſhing. As habits, in order to be ſtrong, muſt be formed in early life, the memories of children ſhould therefore be conſtantly exerciſed; but to oblige them to commit to memory what they do not underſtand, perverts their faculties, and gives them a diſlike to learning." In a word, thoſe who have moſt occaſion for memory, as orators and public ſpeakers, ſhould not ſuffer it to lie idle, but conſtantly employ it in treaſuring up and frequently reviving ſuch things as may be of moſt importance to them; for by theſe means, it will be more at their command, and they may place greater confidence in it upon any emergency."

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[*] Idler.

"Men complain of nothing more frequently than of deficient memory ‡: and indeed every one finds, that after all his efforts many of the ideas which he deſired to retain have ſlipped irretrievably away; that acquiſitions of the mind are ſometimes equally fugitive with the gifts of fortune; and that a ſhort intermiſſion of attention more certainly leſſens knowledge than impairs an eſtate. To aſſiſt this weakneſs of our nature, many methods beſides thoſe which we have mentioned have been propoſed; all of which may be juſtly ſuſpected of being ineffectual: for no art of memory, however its effects may have been boaſted or admired, has been ever adopted into general uſe; nor have thoſe who poſſeſſed it appeared to excel others in readineſs of recollection or multiplicity of attainments." The reader who is deſirous to try the effect of theſe helps, may have recourſe to a treatiſe entitled *A new Method of Artificial Memory*; but the true method of memory is attention and exerciſe.

MEMPHIS, an ancient city, and the royal reſidence of the kings in the Higher Egypt; diſtant from the Delta to the ſouth 15 miles, according to Pliny. Called alſo *Moph* and *Noph*, in ſcripture.

Though this city is now ſo completely ruined, that authors greatly diſagree concerning its ſituation; yet Strabo informs that in his time it was the moſt magnificent in Egypt, next to Alexandria. It was called the capital of the country; and there was an entire temple of Oſiris, where the Apis or ſacred ox was kept and worſhipped. In the ſame place was an apartment of the mother of the ox; a very magnificent temple of Vulcan; a large Circus or ſpace for fighting bulls; and a great Coloſſus in the middle of the city, which was thrown down. There was likewiſe a temple of Venus, and a Serapium in a very ſandy place, where the wind heaps up hills of ſand very dangerous to travellers; together with a number of Sphinxes, the heads of ſome of them only being viſible, the others covered up to the middle of their body. The ſame author likewiſe informs us, that in the front of the city there were many lakes; and that it contained a number of palaces, at that time in ruins. Theſe buildings, he ſaid, formerly ſtood upon an eminence: they lay along the ſide of the hill, ſtretching down to the lakes and groves, 40 ſtadia from the city. There was likewiſe a mountain in the neighbourhood, on which were a great number of pyramids, with the ſepulchres of the kings, among which were three remarkable, and two of them accounted wonders of the world. From this deſcription, Mr Bruce concludes that the celebrated capital of Egypt ſtood in the place where the villages of Metrahenny are now ſituated; in oppoſition to Dr Shaw's opinion, who thinks it was ſituated at Geeza or Giſa.

M. Savary has alſo ſhown, that Giſa was not the ſituation of the ancient Memphis. This ſtood, he ſays, on the weſtern bank of the Nile, on the ſpot where the village of Memph now ſtands, which ſtill preſerves the name. Large heaps of rubbiſh are ſtill to be ſeen there; but the Arabs have tranſported to Cairo the columns and remarkable ſtones, which they have diſpoſed, without taſte and without order, in their moſques and public buildings. This city extended as far as Saccara; and was almoſt wholly encompaſſed by lakes, part of which are ſtill ſubſiſting. It was neceſſary to croſs them to convey the dead to the ſepulchre of their fathers. The tombs, hewn out of the rock, were cloſed up with ſtones of a proportionable ſize, and covered with ſand. Theſe bodies, embalmed with ſo much care, preſerved with ſo much reſpect, are torn from the monuments they repoſe in, and ſold without decency to ſtrangers by the inhabitants of Saccara. This place is called *the plain of mummies*. There too we find *the well of the birds*, into which one deſcends by means of a rope. It leads to ſubterraneous galleries, filled with earthen vaſes, containing the ſacred birds. They are rarely met with entire, becauſe the Arabs break them in hopes of finding idols of gold. They do not conduct travellers into the places where they have found more precious articles. They even cloſe them up carefully, reſerving to themſelves ſome ſecret paſſages by which they deſcend. In a journey into Egypt made by the duke de Chaulnes, he advanced very far into theſe winding labyrinths, ſometimes crawling, and ſometimes ſcrambling, on his knees. Informed by Mr Edward Wortley Montague, who has carefully viſited Egypt, he arrived at one of thoſe paſſages which had an opening ſhut up from without by branches of the date-tree interwoven, and covered with ſand. He remarked there ſome hieroglyphics *in relievo*, executed in the higheſt perfection. But the Arabs reſiſted every offer he made them to permit him to take drawings of them, or to mold them, in order to preſerve their form. The duke de Chaulnes is of opinion that theſe hieroglyphics, ſculptured with ſo much art that the objects they repreſent may be diſcovered at the firſt ſight, might poſſibly furniſh the key of the others, whoſe contours are ſimply expreſſed, and form a ſort of alphabet of this unintelligible language. Several pyramids are diſtinguiſhable along the mountains which bound Saccara on the weſt, the greateſt part of which appear as lofty as thoſe of Giſa. See PYRAMIDS.

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§ Idler.

‡ Elements of Moral Science.

MENAGE (Fr.) denotes a collection of animals; whence we have derived the word *menagery*.

MENAGE (Giles), in Latin *Ægidius*, a celebrated French writer, born at Angers in 1613. He finiſhed his ſtudies in that city, was made advocate, and pleaded for ſome time at Angers, Paris, and Poictiers; but, becoming at length diſguſted with the bar, turned eccleſiaſtic, and gave himſelf up entirely to the ſtudy of polite literature. He at length entered into the family of the cardinal de Retz; but diſagreeing with ſome perſons belonging to his Eminence, went to live in the cloiſter of Notre Dame, where he held an aſſembly of learned men every Wedneſday. He read a great deal; had a prodigious memory; and was inceſſantly quoting in his converſation verſes in Greek, Latin, Italian, French, &c. on which account he was often turned into ridicule by the wits, eſpecially towards the end of his days. His great memory he retained even in his old age; and what is very rare, it returned to him after ſome interruption. The reputation of his works procured him a place in the academy *della Cruſca* at Florence. He might have been a member of the French academy at its firſt inſtitution, if it had not been for his *Requeſte des Dictionnaires*: but when that was forgot, he was propoſed in 1684 to fill up a vacant place in that academy, and was excluded only by the ſuperior intereſt of his competitor Mr Bergent; for there was not one member of all thoſe who gave their votes againſt them, but owned that he deſerved the place. He would not ſuffer his friends to propoſe him again. He died at Paris in 1692, aged 79. He wrote a great number of books in proſe and verſe; the principal of which are, 1. Miſcellaneous works. 2. The Origin of the French Language. 3. The Origin of the Italian Tongue; the beſt edition of which is that of Geneva, in 1685, folio. 4. An edition of Malherbes' Poems, with Notes. 5. An edition of Diogenes Laertius, with Obſervations. 6. Remarks on the French Tongue. 7. Greek, Latin, Italian, and French poems.

MENANDER, an ancient Greek poet, was born at Athens in the ſame year with Epicurus, which was the third of the 109th Olympiad. His happineſs in introducing the new comedy, and refining an art which had been ſo groſs and licentious in former times, quickly ſpread his name over the world. Pliny informs us, that the kings of Egypt and Macedon gave a noble teſtimony of his merit, by ſending ambaſſadors to invite him to their courts, and even fleets to bring him over; but that Menander was ſo much of a philoſopher, as to prefer the free enjoyment of his ſtudies to the promiſed favours of the great. Of his works, which amounted to above 100 comedies, we have had a double loſs, the originals being not only vaniſhed, but the greateſt part of them, when copied by Terence, having unfortunately periſhed by ſhipwreck before they ſaw Rome. Yet the four plays which Terence borrowed from him before that accident happened, are ſtill preſerved in the Roman habit; and it is chiefly from Terence that moſt people form their judgment of Menander, the fragments that remain of him not being ſufficient to enable them to do it. The ancients have ſaid high things of Menander; and we find the old maſters of rhetoric recommending his works as the true patterns of every beauty and every grace of public ſpeaking. Quintilian declares, that a careful imitation of Menander only, will ſatisfy all the rules he has laid down in his Inſtitutions. It is in Menander that he would have his orator ſearch for a copiouſneſs of invention, for a happy elegance of expreſſion, and eſpecially for that univerſal genius which is able to accommodate itſelf to perſons, things, and affections.—But Julius Ceſar has left the loftieſt as well as the juſteſt praiſe of Menander's works, when he calls Terence only a *Half-Menander*. For while the virtues of the Latin poet are ſo deſervedly admired, it is impoſſible we ſhould raiſe a higher notion of excellency than to conceive the great original ſtill ſhining with half its luſtre unreflected, and preſerving an equal part of its graces, above the power of the beſt copier in the world. Menander died in the 3d year of the 122d Olympiad, as we are taught by the ſame old inſcription from which we learn the time of his birth. His tomb, in Pauſanias's age, was to be ſeen at Athens, in the way from the Piræus to the city, cloſe by the honorary monument of Euripides. Quintilian, in his judgement, of Afranius the Roman comedian, who imitated him, cenſures Menander's morals as much as he commends his writings; and his character, according to Suidas, is, that he was a very "mad fellow after women." Phædrus has given him the gait and dreſs of a moſt affected fop:

> "Unguento delibutus, veſtitu adfluens.
> "Veniebat greſſu delicatulo & languido."
> *Lib.* v. fab. 2.

MENANDRIANS, the moſt ancient branch of Gnoſtics; thus called from Menander their chief, ſaid by ſome, without ſufficient foundation, to have been a diſciple of Simon Magus, and himſelf a reputed magician.

He taught, that no perſon could be ſaved, unleſs he were baptiſed in his name: and he conferred a peculiar ſort of baptiſm, which would render thoſe who received it immortal in the next world: exhibiting himſelf to the world, with the phrenſy of a lunatic more than the founder of a ſect, as a promiſed ſaviour. For it appears by the teſtimonies of Irenæus, Juſtin, and Tertullian, that he pretended to be one of the Æons ſent from the pleroma, or eccleſiaſtical regions, to ſuccour the ſouls that lay groaning under bodily oppreſſion and ſervitude; and to maintain them againſt the violence and ſtratagems of the dæmons that hold the reins of empire in this ſublunary world. As this doctrine was built upon the ſame foundation with that of Simon Magus, the ancient writers looked upon him as the inſtructor of *Menander*. See SIMONIANS

MENASSEH (Ben Iſrael), a celebrated rabbi, born in Portugal about the year 1604, was the ſon of Joſeph Ben Iſrael, and followed his father into Holland. Here he was educated by rabbi Iſaac Uziel, under whom he in a ſhort time made ſuch progreſs in the Hebrew tongue, that at 18 years of age he ſucceeded him in the ſynagogue of Amſterdam. In this poſt he continued ſeveral years, and married Rachel of the family of the Abarbanels, whom the Jews imagine to be deſcended from king David. He afterwards went to his brother Ephraim, a rich merchant, who had ſettled at Baſil; by whoſe advice he entered into trade. Some time after, the hopes of a more agreeable ſettlement induced him to come into England, under the protectorſhip of Cromwell; who gave him a very favourable reception, and one day entertained him at his table with ſeveral other learned divines. However, he ſoon after paſſed into Zealand; and died at Middleburg about the year 1657. The Jews at Amſterdam obtained his body, and interred it at their expence. He was of the ſect of the Phariſees; had a lively wit, a ſolid judgment, great learning, and all the virtues that can adorn private life. He wrote many works in Hebrew, Latin, Spaniſh, and Engliſh. The principal of thoſe publiſhed in Latin, are 1. His *Conciliator;* a learned and curious work, in which he reconciles thoſe paſſages of Scripture which ſeem to contradict each other. 2. *De reſurrectione mortuorum.* 3. *De termino vitæ.* 4. *Diſſertatio de fragilitate humana, ex lapſu Adami, deque Divino in bono opere auxilio.* 5. *Spes Iſrael.* Dr Thomas Pococke has written his life in Engliſh.

MENCKE (Lewis Otto), in Latin *Menckenius*, a learned profeſſor of morality at Leipſic, was born at Oldenburg in Weſtphalia in 1644. He ſtudied in ſeveral univerſities of Germany; and became an able philoſopher, civilian, and divine. He was made profeſſor of morality at Leipſic in 1668; and enjoyed that poſt to his death. He was five times rector of the univerſity of that city, and ſeven times dean of the faculty of philoſophy. He publiſhed ſeveral works; but his moſt conſiderable, and what alone is ſufficient to perpetuate his memory, is the *Acta Eruditorum* of Leipſic, of which he was the firſt author, and in which he was engaged till his death. The firſt volume was publiſhed at Leipſic, in 4to, in 1682.

MENCKE (John Burchard), ſon to the preceding. After his ſtudies he travelled into England and Holland; and upon his return was appointed profeſſor of hiſtory at Leipſic in 1699. He gained great reputation by his lectures as well as his writings. He died in 1732, aged 58. He wrote many pieces. His *De Charlataneria eruditorum declamationes duæ*, is an excellent ſatire, deſigned to expoſe the artifices uſed by falſe ſcholars to raiſe themſelves a name. As he named and pointed at certain perſons, it exaſperated them, and they procured his book to be ſeized; but it ſpread, and editions of it were multiplied. He likewiſe publiſhed *Methode pour etudier l'Hiſtoire, avec un catalogue des principaux hiſtoriens*, &c. He made a great many additions to Mr Linglet's book, eſpecially with regard to the German hiſtorians.

MENDELSHON (Moſes), that is, *Moſes the ſon of Mendel*, a Jew of Berlin, and one of the moſt celebrated writers in Germany, died there in the year 1785 at the age of 57. His firſt attempt as an author was in 1755, by a work intitled *Jeruſalem;* in which, beſides other bold and unjuſtifiable opinions, he maintains, that the Jews have a revealed law but not a revealed religion; that opinions are not ſubjects of revelation; and that the only religion of the Jewiſh nation is that of nature. He acquired great honour by his *Phedon*, or "Diſcourſe on the Immateriality and Immortality of the Soul," tranſlated into French 1773, 8vo; in which he unfolds this important truth, the great foundation of all morality, with the wiſdom of an enlightened philoſopher and the charms of an elegant writer. In conſequence of this excellent work, he was ſtyled the *Jewiſh Socrates* by ſome of the periodical writers; but he wanted the firmneſs and courage of the Grecian philoſopher. His timidity, and even puſillanimity, defects too common in ſpeculative men, prevented him from being of any eſſential ſervice to his nation; of which he might have become the benefactor by being the reformer. The pliancy of his character, his ſoft, modeſt, and obliging diſpoſition, gained him the eſteem alike of the ſuperſtitious and of the incredulous After all, he could never procure admiſſion to the Berlin ſociety, or to the converſation of the king of Pruſſia. At his death he received from his nation thoſe honours which are commonly paid to their firſt rabbins. Contrary to an imprudent cuſtom prevalent among the Jews of burying their dead before ſunſet, his interment was delayed till 24 hours after he expired. Though Mendelſhon was deſcended from a reſpectable family, he was very poor. In early life he entered into a counting-houſe of his own nation, wherein he greatly recommended himſelf by his capacity and integrity in buſineſs: But philoſophy and literature ſoon became his principal occupation; and to the famous Leſſing he was indebted for counſels which, without diverting his attention from thoſe purſuits that were neceſſary to his ſubſiſtence, accelerated his progreſs in his literary career. Even after the death of his benefactor, Mendelſhon retained for him the ſinereſt regard and the moſt lively gratitude. Notwithſtanding the very ſtrict regimen which he obſerved, he ſurvived him only a few years; for his feeble frame and weak conſtitution were gradually and inſenſibly undermined by intenſe application to ſtudy.

MENDEZ PINTO (Ferdinand), was born at Montemor-o-velho in Portugal, and was at firſt ſervant to a Portugueſe gentleman. In expectation of making a fortune, he embarked for India in 1537. His veſſel being taken by the Turks on his paſſage, he was carried to Mocka, and ſold to a Greek renegado, and afterwards to a Jew, in whoſe poſſeſſion he continued till he was redeemed by the governor of Ormus, a Portugueſe fort. The governor procured him an opportunity of going out to India, agreeable to his firſt deſign. During a reſidence of twenty-one years in that country, he was witneſs to very important tranſactions, and experienced many ſingular adventures. He returned to Portugal in 1558, where he enjoyed the reward of his labours, after having been thirteen times a ſlave and ſixteen times ſold. A very curious account of his travels was written by himſelf, and publiſhed at Liſbon, A. D. 1614, in folio. This work was tranſlated into French by Bernard Figuier, a Portugueſe gentleman, and printed at Paris 1645, in 4to. It is written in a very intereſting manner, and in a ſtyle more elegant than might have been expected from a man whoſe whole life was ſpent in the camp and in ſlavery. It elucidates a great variety of particulars relating to the geography, hiſtory, and manners of the inhabitants of China, Japan, Pegu, Siam, Achem, Java, &c. Many of his facts appeared fabulous, but their truth has been ſince aſcertained.

M. de Sargi compiled an intereſting hiſtory from the moſt ſingular facts in Mendex Pinto's relation, which he publiſhed in the *Viciſſitudes de la Fortune*. Paris 2 vols. 8vo.

MENDICANTS, or BEGGING FRIARS, ſeveral orders of religious in Popiſh countries, who having no ſettled revenues, are ſupported by the charitable contributions they receive from others.

This ſort of ſociety began in the 13th century; and the members of it, by the tenor of their inſtitution, were to remain entirely deſtitute of all fixed revenues and poſſeſſions; though in proceſs of time their number became a heavy tax upon the people. Innocent III. was the firſt of the popes who perceived the neceſſity of inſtituting ſuch an order; and accordingly he gave ſuch monaſtic ſocieties, as made a profeſſion of poverty, the moſt diſtinguiſhing marks of his protection and favour. They were alſo encouraged and patronized by the ſucceeding pontiffs, when experience had demonſtrated their public and extenſive uſefulneſs. But when it became generally known, that they had ſuch a peculiar place in the eſteem and protection of the rulers of the church, their number grew to ſuch an enormous and unwieldy multitude, and ſwarmed ſo prodigiouſly in all the European provinces, that they became a burden, not only to the people, but to the church itſelf. The great inconvenience that aroſe from the exceſſive multiplication of the mendicant orders was remedied by Gregory X. in a general council, which he aſſembled at Lyons in 1272. For here all the religious orders that had ſprung up after the council held at Rome in 1215, under the potificate of Innocent III. were ſuppreſſed; and the extravagant multitude of mendicants, as Gregory called them, were reduced to a ſmaller number, and confined to the four following ſocieties or denominations, viz. the DOMINICANS, the FRANCISCANS, the CARMELITES and the AUGUSTINS or hermits of St Auguſtin.

As the pontiffs allowed theſe four mendicant orders the liberty of travelling wherever they thought proper, of converſing with perſons of every rank, of inſtructing the youth and multitude wherever they went; and as thoſe monks exhibited, in their outward appearance and manner of life, more ſtriking marks of gravity and holineſs than were obſervable in the other monaſtic ſocieties, they aroſe all at once to the very ſummit of fame, and were regarded with the utmoſt eſteem and veneration through all the countries of Europe. The enthuſiaſtic attachment to theſe ſanctimonious beggars went ſo far, that, as we learn from the moſt authentic records, ſeveral cities were divided or cantoned out into four parts, with a view to theſe four orders; the firſt part being aſſigned to the Dominicans, the ſecond to the Franciſcans, the third to the Carmelites, and the fourth to the Auguſtinians. The people were unwilling to receive the ſacraments from any other hands than thoſe of the mendicants, to whoſe churches they crowded to perform their devotions, while living, and were extremely deſirous to depoſite there alſo their remains after death: nor did the influence and credit of the mendicants end here; for we find in the hiſtory of this and of the ſucceeding ages, that they were employed, not only in ſpiritual matters, but alſo in temporal and political affairs of the greateſt conſequence, in compoſing the differences of princes, concluding treaties of peace, concerting alliances, preſiding in cabinet councils, governing courts, levying taxes, and other occupations, not only remote from, but abſolutely inconſiſtent with, the monaſtic character and profeſſion. However the power of the Dominicans and Franciſcans greatly ſurpaſſed that of the other two orders: inſomuch that theſe two orders were, before the reformation, what the Jeſuits have been ſince that happy and glorious period, the very ſoul of the hierarchy, the engines of the ſtate, the ſecret ſprings of all the motions of the one and the other and the authors and directors of every great and important event, both in the religious and political world. By very quick progreſſion their pride and confidence arrived at ſuch a pitch, that they had the preſumption to declare publicly, that they had a divine impulſe and commiſſion to illuſtrate and maintain the religion of Jeſus; they treated with the utmoſt inſolence and contempt all the different orders of the prieſthood; they affirmed without a bluſh, that the true method of obtaining ſalvation was revealed to them alone; proclaimed, with oſtentation, the ſuperior efficacy and virtue of their indulgencies; and vaunted beyond meaſure their intereſt at the court of heaven, and their familiar connections with the ſupreme Being, the Virgin Mary, and the ſaints in glory. By theſe impious wiles, they ſo deluded and captivated the miſerable, and blinded the multitude, that they would not intruſt any other but the mendicants with the care of their ſouls. They retained their credit and influence to ſuch a degree, towards the cloſe of the 14th century that great numbers of both ſexes, ſome in health others in a ſtate of infirmity, and others at the point of death, earneſtly deſired to be admitted into the Mendicant order, which they looked upon as a ſure and infallible method of rendering heaven propitious. Many made it an eſſential part of their laſt wills, that their bodies after death ſhould be wrapped in old ragged Domincan or Franciſcan habits, and interred among the Mendicants. For ſuch was the barbarous ſuperſtition and wretched ignorance of this age, that people univerſally believed they ſhould readily obtain mercy from Chriſt, at the day of judgment, if they appeared before his tribunal aſſociated with the Mendicant friars.

About this time, however, they fell under an univerſal odium; but being reſolutely protected againſt all oppoſition, whether open or ſecret, by the popes, who regarded them as their beſt friends and moſt effectual ſupports, they ſuffered little or nothing from the efforts of their numerous adverſaries. In the 15th century, beſides their arrogance, which was exceſſive, a quarelſome and litigious ſpirit prevailed among them, and drew upon them juſtly the diſpleaſure and indignation of many. By affording refuge at this time to the Beguins in their order, they became offenſive to the biſhops, and were hereby involved in difficulties and perplexities of various kinds. They loſt their credit in the 16th century by their ruſtic impudence, their ridiculous ſuperſtitions, their ignorance, cruelty, and brutiſh manners. They diſcovered the moſt barbarous averſion to the arts and ſciences and expreſſed a like abhorrence of certain eminent and learned men, who endeavoured to open the paths of ſcience to the purſuits of the ſtudious youth, recommended the culture of the mind, and attacked the barbariſm of the age in their writings and diſcourſe. Their general character, together with other circumſtances, concurred to render a reformation deſirable, and to accompliſh this happy event.

Among the number of Mendicants are alſo ranked the Capuchins, Recollects, Minims, and others, who are branches or derivations from the former.

Buchannan tells us, the Mendicants in Scotland, under an appearance of beggary, lived a very luxurious life whence one wittily called them, not *Mendicant*, but *Manducant* friars.

MENDOZA (Juan Gonzales de), an Auguſtan friar, of the province of Caſtile, was made ambaſſador from the king of Spain to the emperor of China. In 1593, he was made biſhop of Liperi in Italy. In 1607 he was made biſhop of Chiapa in New Spain, and the next year was removed to the ſee of Popaian in the Weſt Indies. He wrote a hiſtory of China in Spaniſh, which has been tranſlated into ſeveral languages.

MENE, a Chaldæan word, which ſignifies "he has numbered or counted;" being one of the three words that was written upon the wall by the hand that appeared to Belſhazzar, the laſt king of Babylon, the night that he was put to death. See Belshazzar.

MENECRATES, a phyſician of Syracuſe, who flouriſhed about 360 B. C. is famous for his ſkill in his profeſſion, but much more for his vanity. He would always be followed by ſome of the patients he had cured, and with whom he previouſly ſtipulated and they ſhould follow him wherever he went. One appeared with the attributes of Hercules, another with thoſe of Apollo, and others again with thoſe of Mercury or Æſculapius; while he, clad in a purple robe, with a golden crown on his head, and a ſceptre in his hand, preſented himſelf, to the admiration of the public, under the name of *Jupiter*, and travelled through different countries eſcorted by theſe counterfeit deities. He once wrote the following letter to the king of Macedon: Menecrates-Jupiter to Philip, greeting. Thou reigneſt in Macedonia, and I in medicine; thou giveſt death to thoſe who are in good health, I reſtore life to the ſick; thy guard is compoſed of Macedonians; the gods themſelves conſtitute mine." Philip anſwered him in a word, that he wiſhed him reſtored to reaſon. Learning ſome time after that he was in Macedon, Philip ſent for him, and invited him to an entertainment. Menecrates and his companions were placed on rich and lofty couches; before which was an altar, covered with the firſt fruits of the harveſt; and whilſt an excellent repaſt was ſerved up to the other gueſts, perfumes and libations only were offered to theſe new gods, who, unable to endure the affront, haſtily left the palace, in which they never more made their appearance.

MENEDEMUS, a Greek philoſopher, born at Erythreum, was the ſon of Caliſthenes, and one of Phedo's followers. He was in greateſt eſteem, and, enjoyed ſeveral important poſts, in his own country. He ſeveral times defended Erythreum with great bravery, and died of grief when Antigonus became maſter of it. A perſon one day ſaying to him, "It is a great happineſs to have what we deſire," he replied, "It is a much greater to deſire nothing but what we have." He flouriſhed about 300 B. C.

MENELAUS, the ſon of Atreus, and the brother of Agamemnon, reigned at Sparta, when Paris deprived him of his wife Helen. This rape occaſioned the famous war of Troy. See Helen.

Menelaus, a mathematician in the reign of the emperor Trajan, wrote three books on the *Sphere*, which have been publiſhed by father Marſenne.

MENES, born at This, a town of Thebais in Upper Egypt, was the founder of the Egyptian empire. He had three ſons, viz. Athotis, who ruled after him at This and Thebes; Curudes, who in Lower Egypt founded the kingdom of Heliopoli, which afterward was the kingdom of Dioſpoli; and Necherophes, who reigned at Memphis. It is thought this Menes reigned 117 years after the birth of Phaleg, ſon of Heber, which was the very year of the diſperſion of the people throughout the whole earth. In building Memphis he ſtopped the Nile near it, by the invention of a cauſeway 100 furlongs broad, and cauſed it to run through the mountains.

MENESTRIER (John Baptiſt le), a native of Dijon, and one of the moſt learned and curious French antiquaries of his time, wrote, 1. A Treatiſe on the Medals, Money, and Ancient Monuments, of the Roman Empreſſes, in folio. 2. The moſt famous Medals of the Ancient Roman Emperors and Empreſſes, in quarto. He died in 1634, aged 70.

MENGS (Anthony Raphael), firſt painter to the king of Spain, was born at Auſſig in Bohemia, A. D. 1728. His father, painter to Auguſtus III. king of Poland, perceiving his ſuperior talents, carried him from Dreſden to Rome in 1741. After having there purſued his art for four years, and copied the principal monuments of that capital, he returned to Dreſden, where he executed different works for Auguſtus with very uncommon ſucceſs. During his abode in Italy, he became acquainted with Don Carlos king of Naples; and when this prince ſucceeded to the crown of Spain in 1761, he was careful to engage Mengs in his ſervice, by granting him an yearly penſion of 2000 doubloons, together with a houſe and equipage. He lived, however, chiefly at Rome; where in 1779 he fell a ſacrifice to his confidence in a German quack, who pretended to cure him of a diſeaſe which he had contracted partly by his intenſe application, and partly by grief for the loſs of his wife. His natural timidity and great ignorance of the world, the diſtruſt which ſeemed to be expreſſed in his air and manners, and his melancholy conſtitution of body, by no means leſſened the envy of his rivals. Under this rude appearance, he had a heart full of kindneſs and humanity. On one occaſion, when he perceived that he had offended a certain perſon by his bluntneſs (excuſable only in a great genius), he was not only ſorry for his inattention, but he aſſiſted with his advice the painter whom he had offended. He made no myſtery of his art any more than his ſentiments. Clement XIV. ſubmitted to his judgment ſome pictures of no great value, and in excuſe told him that he had bought them at the recommendation of an eminent painter. "This man and I (replied Mengs) are two artiſts, one of whom praiſes every thing which he cannot equal, and the other blames every thing which he can ſurpaſs." His manners were pure and ſimple, and enthuſiaſm for the arts had almoſt extinguiſhed in him every other paſſion. He was a good huſband and a good father; and his family could reproach him with nothing but want of economy and unbounded generoſity. Although he had received during the laſt 18 years of his life more than 250.000 livres, he hardly left wherewithal to defray the expences of his funeral. The king of Spain adopted his five daughters, and granted penſions to his two ſons. His chief works in the line of his profeſſion are at Madrid and at Rome. A catalogue of them is to be found in the account of his life prefixed to his whole works, in 2 vols 4to, publiſhed at Parma in 1780 by the Chevalier d' Azara, with notes. The firſt volume contains, 1. Reflections on the *beautiful*, and on taſte in painting. 2. Reflections on Raphael, Corregio, Titian, &c. 3. On the means of promoting the cultivation of the fine arts in Spain.—The ſecond volume contains, 1. Two letters on the group of Niobé. 2. A letter on the origin, progreſs, and decline of drawing. 3. A letter on the principal paintings at Madrid. 4. Memoirs of the life and works of Correggio. 5. Memoirs concerning the academy of fine arts at Madrid. 6. Practical leſſons in painting. Part of his works have been tranſlated into French by M. Doray de Longrais, and publiſhed at Paris 1782 in 8vo. A collection of them was lately publiſhed in 4to, 2 vols, 1787.—Mengs placed Raphael at the head of modern painters for deſign and expreſſion, Corregio for gracefulneſs of attitude and the *claro obſcuro*, and Titian for colouring. He formed his own ſtyle upon the different excellencies of thoſe three artiſts. He united the moſt ſublime expreſſion to the trueſt colouring, and to that knowledge of different effects which captivates the ſenſes at the firſt impreſſion, and which will bear the moſt rigid examination. His paintings poſſeſs chiefly that grace which one feels without being able to explain. Nobody ever ſtudied the ancients with greater care than he did. The technical part in *l'Hiſtoire de l'Art*, by his friend the Abbé Winckelman, is of his compoſition. He reſpected and admired the ancients; but he was deſtitute of that exceſſive zeal which makes their votaries conceal thoſe faults which they perceive.

MENIALS, domeſtic or houſehold ſervants, who live under their lord or maſter's roof.

MENINGES, or Menynges, in anatomy, a name given to the dura and pia mater of the brain. See Anatomy, n° 126.

MENINX, an iſland in the Mediterranean, to the weſt of the Syrtis Minor. Suppoſed by Strabo and Polybius to be Homer's country of the Lotophagi; and hence Ptolomy and Eratoſthenes denominate the iſland *Lotophagitis*, with a cognominal town *Meninx*. It was the country of Vibius Gallus the emperor, and of Voluſianus. Now called *Gerbi* and *Zarbi*.

MENIPPUS, a cynic philoſopher of Phœnicia. He was originally a ſlave, but obtained his liberty with a ſum of money, and became one of the greateſt uſurers at Thebes. He grew ſo deſperate from the continual reproaches and inſults to which he was daily expoſed on account of his meanneſs, that he deſtroyed himſelf. He wrote 14 books of ſatires, which have been loſt,

MENIPPEAN (*ſatira Menippea*), a kind of ſatire conſiſting of proſe and verſe intermixed. It is thus called from Menippus a cynic philoſopher who delighted in compoſing ſatirical letters, &c. In imitation of him, Varro alſo wrote ſatires under the title of *Satiræ Menippeæ;* whence this ſort of compoſition is alſo denominated *Varronian ſatire*.

Among the moderns there is a famous piece under this title firſt publiſhed in 1594, againſt the chiefs of the league, called alſo the *Catholicon* of Spain. It is eſteemed a maſter-peice for the time.

MENISCUS, in optics, a glaſs or lens, concave on one ſide and convex on the other; ſometimes alſo called *lunula*. See Optics.

MENISPERMUM, moonseed: A genus of the decandria order, belonging to the diœcia claſs of plants; and in the natural method ranking under the 11th order, *Sarmentaceæ*. The male has four exterior and eight interior petals; there are 16 ſtamina; the corolla of the female is the ſame as in the male; there are eight barren ſtamina, and two monoſpermous berries. There are three ſpecies, all of them climbing plants, riſing 14 feet high, and natives of warm climates; but no way remarkable for beauty. The ſeeds of a kind which grows in the Levant, being formed into a paſte, are regarded by the inhabitants as ſpecific againſt lice and cutaneous eruptions. The ſame paſte is likewiſe uſed for the purpoſe of intoxicating fiſhes. See *Cocculus Indicus*.

MENNITH, or Minnith, Judges xi. 33. a town near Heſhbon (Jerome), in Arabia Petræa; in a diſtrict named *Ecoſipolis*, or *twenty-towns*, (Cellarius). There is alſo a Minnith mentioned Ezekiel xxvii. as being in a good wheat country; but whether the ſame with the foregoing is uncertain; though ſome think that the firſt Minnith lay in the country of Ammon, (Wells).

MENNONITES, a ſect in the United Provinces, in moſt reſpects the ſame with thoſe in other places called *Anabaptiſts*.

They had their riſe in 1536, when Menno-Simon, a native of Frieſland, who had been a Romiſh prieſt, and a notorious profligate, reſigned his rank and office in the Romiſh church, and publicly embraced the communion of the Anabaptiſts.

Menno was born at Witmarſum, a village in the neighbourhood of Balſwert in Frieſland in the year 1505, and died in 1561 in the duchy of Holſtein, at the country ſeat of a certain nobleman not far from the city of Oldeſloe, who, moved with compaſſion by a view of the perils to which Menno was expoſed, and the ſnares that were daily laid for his ruin, took him with certain of his aſſociates into his protection, and gave him an aſylum. The writings of Menno, which are almoſt all compoſed in the Dutch language, were publiſhed in folio at Amſterdam in the year 1651. About the year 1537, Menno was earneſtly ſolicited by many of the ſect with which he connected himſelf, to aſſume among them the rank and functions of a public teacher; and as he looked upon the perſons who made this propoſal to be exempt from the fanatical phrenzy of their brethern at Munſter (though according to other accounts they were originally of the ſame ſtamp, only rendered ſomewhat wiſer by their ſufferings), he yielded to their intreaties. From this period to the end of his life, he travelled from one country to another with his wife and children exerciſing his miniſtry, under preſſures and calamities of various kinds, that ſucceeded each other without interruption, and conſtantly expoſed to the danger of falling a victim to the ſeverity of the laws. Eaſt and Weſt Frieſland, together with the province of Groningen, were firſt viſited by this zealous apoſtle of the Anabaptiſts; from whence he directed his courſe into Holland, Gelderland, Brabant, and Weſtphalia, continued it through the German provinces that lie on the coaſts of the Baltic Sea, and penetrated ſo far as Livonia. In all theſe places his miniſterial labours were attended with remarkable ſucceſs, and added to his ſect a prodigious number of followers. Hence he is deſervedly conſidered as the common chief of almoſt all the *Anabaptiſts*, and the parent of the ſect that ſtill ſubſiſts under that denomination. Menno was a man of genius, undirected by a very ſound judgment; he poſſeſſed a natural and perſuaſive eloquence, and ſuch a degree of learning as made him paſs for an oracle in the eſtimation of the multitude. He appears, moreover, to have been a man of probity, of a meek and tractable ſpirit, gentle in his manners, pliable and obſequious in his commerce with perſons of all ranks and characters, and extremely zealous in promoting practical religion and virtue, which he recommended by his example as well as by his precepts. The plan of doctrine and diſcipline drawn up by Menno was of a much more mild and moderate nature than that of the furious and fanatical ANABAPTISTS, whoſe tumultuous proceedings have been recited under that article, but ſomewhat more ſevere though more clear and conſiſtent than the doctrine of the wiſer branches of that ſect, who aimed at nothing more than the reſtoration of the Chriſtian church to its primitive purity. Accordingly he condemned the plan of eccleſiaſtical diſcipline that was founded on the proſpect of a new kingdom, to be miracuouſly eſtabliſhed by Jeſus Chriſt on the ruins of civil government and the deſtruction of human rulers, and which had been the fatal and peſtilential ſource of ſuch dreadful commotions, ſuch execrable rebellions, and ſuch enormous crimes. He declared publicly his diſlike of that doctrine, which pointed out the approach of a marvellous reformation in the church by the means of a new and extraordinanary effuſion of the Holy Spirit. He expreſſed his abhorrence of the licentious tenets, which ſeveral of the Anabaptiſts had maintained, with reſpect to the lawfulneſs of polygamy and divorce; and finally, conſidered as unworthy of toleration thoſe fanatics who were of opinion that the Holy Ghoſt continued to deſcend into the minds of many choſen believers, in as extraordinary a manner as he did at the firſt eſtabliſhment of the Chriſtian church, and that he teſtified this peculiar preſence to ſeveral of the faithful by miracles, predictions, dreams, and viſions of various kinds. He retained indeed the doctrines commonly received among the Anabaptiſts, in relation to the baptiſm of infants, the *millenium*, or 1000 years reign of Chriſt upon earth, the excluſion of magiſtrates from the Chriſtian church, the abolition of war, and the prohibition of oaths enjoined by our Saviour, and the vanity as well as the pernicious effects of human ſcience. But while Menno retained theſe doctrines in a general ſenſe, he explained and modified them in ſuch a manner as made them reſemble the religious tenets that were univerſally received in the Proteſtant churches; and this rendered them agreeable to many, and made them appear inoffenſive even to numbers who had no inclination to embrace them. It however ſo happened, that the nature of the doctrines conſidered in themſelves, the eloquence of Menno which ſet them off to ſuch advantage, and the circumſtances of the times, gave a high degree of credit to the religious ſyſtem of this famous teacher among the Anabaptiſts, ſo that it made a rapid progreſs in that ſect. And thus it was in conſequence of the miniſtry of Menno, that the different ſorts of Anabaptiſts agreed together in excluding from their communion the fanatics that diſhonoured it, and in renouncing all tenets that were detrimental to the authority of civil government, and by an unexpected coalition formed themſelves into one community.

Though the Mennonites uſually paſs for a ſect of Anabaptiſts, yet M. Herman Schyn, a Mennonite miniſter, who has publiſhed their hiſtory and apology, maintains, that they are not Anabaptiſts either in principle or by origin. However, nothing can be more certain than this fact, viz. that the firſt Mennonite congregations were compoſed of the different ſorts of Anabaptiſts, of thoſe who had been always inoffenſive and upright, and of thoſe who, before their converſion by the miniſtry of Menno, had been ſeditious fanatics: beſides it is alledged, that the Mennonites do actually retain, at this day, ſome of thoſe opinions and doctrines, which led the ſeditious and turbulent Anabaptiſts of old to the commiſſion of ſo many and ſuch enormous crimes: ſuch particularly is the doctrine concerning the nature of Chriſt's kingdom, or of the church of the New Teſtament, though modified in ſuch a manner as to have loſt its noxious qualities, and to be no longer pernicious in its influence.

The Mennonites are ſubdivided into ſeveral ſects; whereof the two principal are the *Flandrians* or FLEMINGIANS, and the WATERLANDIANS. The opinions, ſays Moſheim, that are held in common by the Mennonites, ſeem to be all derived from this fundamental principle, that the kingdom which Chriſt eſtabliſhed upon earth is a viſible church or community, into which the holy and juſt alone are to be admitted, and which is conſequently exempt from all thoſe inſtitutions and rules of diſcipline that have been invented by human wiſdom, for the correction and reformation of the wicked. This principle, indeed, was avowed by the ancient Mennonites, but it is now almoſt wholly renounced: nevertheleſs, from this ancient doctrine, many of the religious opinions that diſtinguiſh the Mennonites from all other Chriſtian communities, ſeem to be derived: in conſequence of this doctrine, they admit none to the ſacrament of baptiſm but perſons that are come to the full uſe of their reaſon; they neither admit civil rulers into their communion, nor allow any of their members to perform the functions of magiſtracy; they deny the lawfulneſs of repelling force by force, and conſider war, in all its ſhapes, as unchriſtian and unjuſt; they entertain the utmoſt averſion to the excution of juſtice, and more eſpecially to capital puniſhments; and they alſo refuſe to confirm their teſtimony by an oath. The particular ſentiments that divided the more conſiderable ſocieties of the Mennonites are the following: The rigid Mennonites, called the *Flemingians*, maintain, with various degrees of rigour, the opinions of their founder Menno, as to the human nature of Chriſt, alledging that it was produced in the womb of the Virgin by the creating power of the holy Ghoſt; the obligation that binds us to waſh the feet of ſtrangers, in conſequence of our Saviour's command; the neceſſity of excommunicating and avoiding, as one would do the plague, not only avowed ſinners, but alſo all thoſe who depart, even in ſome light inſtances pertaining to dreſs, &c. from the ſimplicity of their anceſtors; the contempt due to human learning, and other matters of leſs moment. However this auſtere ſyſtem declines, and the rigid Mennonites are gradually approaching towards the opinions and diſcipline of the more moderate or *Waterlandians*.

The firſt ſettlement of the Mennonites, in the United Provinces, was granted them by William prince of Orange, towards the cloſe of the 16th century; but it was not before the following century that their liberty and tranquillity were fixed upon ſolid foundations, when, by a confeſſion of faith publiſhed in the year 1626, they cleared themſelves from the imputations of thoſe pernicious and deteſtable errors that had been laid to their charge. In order to appeaſe their inteſtine diſcords, a conſiderable part of the Anabaptiſts of Flanders, Germany, and Frieſland, concluded their debates in a conference held at Amſterdam, in the year 1630, and entered into the bonds of fraternal communion, each reſerving to themſelves a liberty of retaining certain opinions. This aſſociation was renewed and confirmed by new reſolutions, in the year 1649; in conſequence of which the rigorous laws of Menno and his ſucceſſors were, in various reſpects, mitigated and corrected.

MENOCHIUS, vulgarly Menochia, (James), a famous lawyer, meanly born at Pavia, but who became ſo ſkilful in the law, that he was called the *Baldus* and *Bartholus* of his age; all the princes of Italy ſoliciting him to their univerſities. He read at Padua 23 years together; and for love of his country removed to Pavia, and ſucceeded Nicholas Gratiani. He hath got an immortal fame by his works, *De recuperanda poſſeſſione; De adipiſcenda poſſeſſione; De preſumptionibus; De arbitrariis Judicum queſtionibus & cauſis conciliorum*, tom. 13 &c. He died in 1607, aged 75.

MENOLOGY Menologium, (from *μην*, *month*, and λογος, *diſcourſe)*, is much the ſame as martyrology, or callendar, in the Latin.

The Greek menologium is divided into the ſeveral months in the year; and contains an abridgement of the lives of the ſaints, with a bare commemoration of the names of ſuch whoſe lives were never written. The Greeks have various menologies; and the Romans tax them with inſerting divers heretics in their menologies as ſaints.—Baillet treats of them at large.

MENSA, in law-books, a term that includes in it all patrimony, and neceſſaries for livelihood.

MENSALS, mensalia, in church-hiſtory, ſuch livings as were formerly united to the tables of religious houſes, and hence called *menſal benefices*. See the article Benefice.

MENSES, Catamenia, in medicine, the monthly evacuations from the uterus of women not with child or not giving ſuck. They are ſo called from *menſis* "month," the period wherein they return. They are alſo called *flowers*, *courſes*, &c. By the Jewiſh law a woman was unclean while the menſtrual blood flowed; and the man who touched her, or the moveables ſhe had touched, was declared unclean.—Levit. xv.

The menſes make one of the moſt curious and difficult phenomena in the whole human body; for the explanation whereof, many hypotheſes have been framed, though the matter is yet ſcarcely aſcertained.

It is generally agreed by all, that the neceſſity women are under for ſome extraordinary ſupply to compenſate the expence, and ſupport them during the time of geſtation, was the final reaſon why this redundance at other times was given them, which continues whilſt this neceſſity ſubſiſts, and ceaſes when, according to the conſtitution of the female frame, it is no longer required: but this is all they agree in. Some, not content with this occaſion alone, will have the menſtruous blood offend in quality more than quantity; which they argue from the pain it gives many women in the evacuation; with many other idle notions.

Others aſcribe this effect to an imaginary dominion of the moon over the bodies of women. This was formerly the prevailing opinion; though the ſmalleſt reflection would have ſhown the weakneſs of it: for, had this purgation been owing to the influence of the moon, all women of the ſame age and temperament would have found it at the ſame periods and revolutions of the moon, *i. e.* at the ſame time; which all experience ſhows to be falſe.

There are two other opinions which carry with them great probability, and are argued with a great deal of ſtrength and reaſon; in both which, the quality of the blood is allowed to be innocent, but they ſtill differ about the reaſon of its iſſue. The former is that of Dr Bohn and Dr Friend, who maintain this flux to be the reſult of a plethora or plenitude; and to be evacuated only for relief againſt the quantity.

Dr Friend, who has maintained the cauſe of a plethora with the greateſt ſtrength and clearneſs, ſuppoſes, that this plethora ariſes from a coacervation in the blood-veſſels of a ſuperfluity of aliment, which, he thinks, remains over and above what is expended by the ordinary ways; and that women have this plethora, and not men, becauſe their bodies are more humid, and their veſſels, eſpecially the extremities of them, more tender, and their manner of living generally more inactive than that of men; and that theſe things concurring, are the occaſion that women do not perſpire ſufficiently to carry off the ſuperfluous alimentary parts, till they be accumulated in ſuch quantities as to diſtend the veſſels, and force their way thro' the capillary arteries of the uterus. It is ſuppoſed to happen to women more than the females of other ſpecies, which have the ſame parts, becauſe of the erect poſture of the former, and the vagina and other canals being perpendicular to the horizon; ſo that the preſſure of the blood is directed towards their orifices; whereas in brutes, they are parallel to the horizon, and the preſſure wholly is on the ſides of thoſe veſſels. The diſcharge, he thinks, happens in this part rather than in any other, as being more favoured by the ſtructure of the veſſels; the arteries being very numerous, and the veins ſinous and winding, and therefore more apt to retard the impetus of the blood; and conſequently, in a plethoric caſe, to occaſion the rupture of the extremities of the veſſels, which may laſt, till, by a ſufficient diſcharge, the veſſels are eaſed of their overload.

This is the ſubſtance of Dr Freind's theory; from whence he very mechanically and very philoſophically accounts for the ſymptoms.

To his argument, why women have menſes rather than men, we may add from Boerhave, that, in the former, the *os ſacrum* is wider, and ſtands farther out, and the *os coccyges* farther in; the *oſſa innominata* wider, and farther apart, and the loweſt of them, as well as the lower eminences of the *os pubis*, farther outwards than in the latter. Hence, in women, the latitude or expanſion about theſe bones, and the capacity of the *pelvis*, is vaſtly great in proportion to thoſe of men; and yet, in a woman not pregnant, there is not much to fill this expanſe. Again, the foreſide of the thorax is ſmoother in women than in men and the blood-veſſels, lymphatics, adipoſe, and nervous veſſels, membranes, and fibres, are much laxer in women than in men: whence all their cavities, cells, veſſels. &c. are more eaſily repleniſhed, and the humours aggregated in them; beſides, that they are found to perſpire leſs than men, and to arrive much ſooner at their maturity, or *ακμη* of increaſe. To which he adds the conſideration of the ſoft pulpous texture of the uterus and the vaſt number of veins and arteries with which it is filled. Hence a healthy maid, being arrived at her growth, begins to prepare more nutriment than is required for the ſupport of the body; which, as there is not to be any farther accretion, muſt of neceſſity fill the veſſels, and eſpecially thoſe of the uterus and breaſts, they being the leaſt compreſſed. Theſe will be dilated more than the others; whence the lateral vaſcules evacuating their humour into the cavity of the uterus, it will be filled and extended. Hence a pain, heat, and heavineſs, will be felt about the loins, pubes, &c. the veſſels of the uterus, at the ſame time, will be ſo dilated as to emit blood into the cavity of the uterus, and its mouth will be lubricated and looſened, and blood iſſue out. As the quantity of blood is diminiſhed, the veſſels will be leſs preſſed, and will contract themſelves again cloſer, ſo as again to retain the blood, and let paſs the groſſer part of the ſerum; till at length only the uſual ſerum paſſes. Again, there are more humours prepared, which are more eaſily lodged in veſſels once dilated; and hence the menſes go and return at various periods in various perſons.

This hypotheſis, however plauſible, is oppoſed by Dr Drake, who maintains, that there is no ſuch repletion, or at leaſt that it is not neceſſary to menſtruation, arguing, that, if the menſes were owing to a plethora ſo accumulated, the ſymptoms would ariſe gradually, and the heavineſs, ſtiffneſs, and inactivity, neceſſary ſymptoms of a plethora, would be felt long before the periods were completed, and women would begin to be heavy and indiſpoſed ſoon after evacuation, and the ſymptoms would increaſe daily; which is contrary to all experience, many women, who have them regularly and eaſily, having no warning, nor any other rule to prevent an indecent ſurpriſe, than the meaſure of the time; in which, ſome that have ſlipped, have been put to confuſion and ſhifts no ways conſiſtent with the notice a plethoric body would give. He adds, that even in thoſe who are difficultly purged this way, the ſymptoms, though very vexatious and tedious, do not make ſuch regular approaches as a gradual accumulation neceſſarily requires. If we conſider what violent ſymptoms come on in an hour, we ſhall be extremely puzzled to find the mighty acceſſion of matter, which ſhould, in an hour or a day's time, make ſuch great alterations. According to the hypotheſis, the laſt hour contributed no more than the firſt; and of conſequence, the alteration ſhould not be greater in the one than in the other, ſetting aſide the bare eruption.

This is the ſubſtance of what is argued againſt Dr Freind's theory: which, is muſt be owned, notwithſtanding theſe objections, is ſtill the moſt rational and conſiſtent that has yet been advanced.

Thoſe who oppoſe it, give into the doctrine of fermentation, and maintain the evacuation of blood in thoſe parts to be an effect of an efferveſcence or ebullition of the blood. This opinion has been maintained by many, particularly by Dr Charleton, Bale, De Graaf, and Drake; the two firſt of whom ſuppoſe a ferment peculiar to the women, which produces this flux, and affects that part only, or at leaſt principally. Dr Graaf, leſs particular in his notion, only ſuppoſes an efferveſcence of the blood, raiſed by ſome ferment, without aſſigning how it acts, or what it is. The ſudden turgeſcence of the blood occaſioned them all to think, that it aroſe from ſomething till then extraneous to the blood, and led them to the parts principally affected to ſeek for an imaginary ferment, which no anatomical inquiry could ever ſhow, or find any receptacle for, nor any reaſoning neceſſarily infer. Again, that heat which frequently accompanies this turgeſcence, led them to think the caſe more than a plethora, and that there was ſome extraordinary inteſtine motion at that time,

Dr Drake improves on the doctrine of a ferment; and contends, not only that it is neceſſary there ſhould be a ferment, but a receptacle alſo for this ferment; concluding, from the ſuddenneſs and violence of the ſymptoms, that a great quantity muſt be conveyed into the blood in a ſhort time, and conſequently, that it muſt have been ready gathered in ſome receptacle, where, while it was lodged, its action was reſtrained. But he goes farther ſtill, and pretends to aſcertain the place, &c. both of the one and the other, making the gall-bladder to be the receptacle, and the bile the ferment. This liquor he thinks well adapted to raiſe a fermentation in the blood, when diſcharged into it in a quantity; and, as it is contained in a receptacle that does not admit of a continual iſſue, it may be there reſerved, till in a certain period of time the bladder becoming turgid and full, through the compreſſion of the incumbent viſcera, it emits the gall; which, by the way of the lacteals, inſinuating itſelf into the blood, may raiſe that efferveſcence which occaſions the rupture of the uterine arteries. To confirm this, he alledges, that perſons of a bilious conſtitution have the menſes either more plentifully, or more frequently, than others; and that diſtempers manifeſtly bilious, are attended with ſymptoms reſembling thoſe of women labouring under difficult menſtruation. —If it be objected, that on this principle men ſhould have menſes as well as women, he anſwers, that men do not abound in bile ſo much as women, the pores of the former being more open, and carrying off more of the ſerous part of the blood, which is the vehicle of all the other humours, and conſequently a greater part of each is diſcharged through them than in women, wherein the ſuperfluity muſt either continue to circulate with the blood, or be gathered into proper receptacles, which is the caſe in the bile. The ſame reaſon he gives why menſtruation ſhould not be in brutes: the pores of theſe being manifeſtly more open than thoſe of women, as appears from the quantity of hair which they bear, for the vegetation whereof a large cavity, and a wider aperture of the glands, is neceſſary, than where no ſuch thing is produced: yet there is ſome difference between the males and females even among theſe, ſome of the latter having their menſes, though not ſo often, nor in the ſame form and quantity, as women.

He adds, that the ſeveral phenomena of the menſes, whether in a natural, a regular, or diſeaſed caſe, flow naturally and readily from this hypotheſis; and that whatever may be accounted for from a plethora, or from any particular ferment, may without any ſtraining be applied to this.

Females generally begin to menſtruate about the age of fourteen or fifteen, and ceaſe about fifty; though inſtances have occurred of their commencing ſooner and continuing longer. There are, therefore, two critical periods in the lives of females which require their particular attention. In order to eſcape the chloroſis, and other ſimilar diſeaſes, incident to that period of life when the menſes commence, they ſhould avoid indolence and inactivity, and accuſtom themſelves to exerciſe in the open air as much as poſſible. Unwholeſome food, dulneſs of diſpoſition, and ſtrait cloaths, are very injurious to females at this ſeaſon. The diſcharge in the beginning is ſeldom ſo inſtantaneous as to ſurpriſe them unawares. The eruption is generally preceded by ſymptoms that indicate its approach; ſuch as a ſenſe of heat, weight, and dull pain in the loins; diſtenſion and hardneſs of the breaſts, head-ach, loſs of appetite, laſſitude, paleneſs of the countenance and ſometimes a ſlight degree of fever. When theſe ſymptoms occur, every thing ſhould be carefully avoided which may obſtruct the menſtrual flux, and all means uſed to promote it; as ſitting frequently over the ſteams of warm water, drinking warm diluting liquors, &c. When the menſes have begun to flow great care ſhould be taken to avoid every thing that tends to obſtruct them; ſuch as fiſh, and all kinds of food that are hard of digeſtion, and cold acid liquors. Cold is likewiſe hurtful at this period; as alſo anger, fear, grief, and other affections of the mind. From whatever cauſe this flux is obſtructed, except in the ſtate of pregnancy, proper means ſhould be uſed to reſtore it; and if exerciſe in a dry, open, and rather cool air, wholeſome diet, generous liquors in a weak and languid ſtate of the body, chearful company, and amuſement fail, recourſe muſt be had to medicine.—When obſtructions proceed from a weak relaxed ſtate of the ſolids, ſuch medicines as tend to promote digeſtion, to brace the ſolids, and aſſiſt the body in preparing good blood, ought to be uſed. See *Medicine-Index*.

When the menſtrual flux is too great, the patient becomes weak, the colour pale, the appetite and digeſtion are bad, and œdematous ſwellings of the feet, dropſies, and conſumptions, often enſue. This frequently happens to women about the age of forty-five or fifty, and is very difficult of cure. It may proceed from a ſedentary life; a full diet, conſiſting chiefly of ſalted, high ſeaſoned, or acrid food; the uſe of ſpirituous liquors; exceſſive fatigue; relaxation; a diſſolved ſtate of the blood; violent paſſions of the mind, &c. In order to reſtrain the flux, the patient ſhould be kept eaſy both in body and mind. If it be very violent, ſhe ought to lie in bed with her head low; to live upon a cool and ſlender diet, as veal or chicken-broths with bread, and to drink decoctions of nettle-roots or the greater comfrey. If theſe fail, recourſe muſt be had to ſtronger aſtringents, &c. See Medicine n° 246.

The diſcharge of the menſes is interrupted naturally during pregnancy: but this is not always the caſe, becauſe ſome have them three months, ſome ſix months, and ſome during the whole time of geſtation, though in leſs quantity than at other times. The menſes are moſtly interrupted during the time of giving ſuck, though many women have a return about the third or fourth month after delivery, and almoſt all have them again in the ninth or tenth month. In caſes of obſtruction, the menſtrual blood hath diſcharged itſelf by other outlets.

It uſually happens that this periodical diſcharge ceaſes between the age of forty and fifty; and the ſeaſon in which this takes place is critical to the ſex.—However, thoſe who ſurvive this period without contracting any chronical diſeaſe, become more healthy and vigorous than they were before. About this time, ſome are afflicted with the well known ſymptoms of plethora, heat, fluſhings, reſtleſs nights, troubleſome dreams, and unequal ſpirits; others are attacked with inflammations of the bowels, or other internal parts; ſpaſmodic affections of various parts, ſtiffneſs in the limbs, ſwelled ancles, with pain and inflammation, the piles, and other effects of plenitude. Thoſe of full plethoric habits, accuſtomed to copious evacuations, will find great relief by bleeding frequently in moderate quantities, keeping the bowels lax, moderating their diet, and uſing ſufficient exerciſe that is not too heating. If an immoderate flux of the menſes happen at this period, it ſhould be reſtrained by gentle laxatives, cooling medicines, reſt, anodynes, a more ſparing not too liquid diet, rather than by very copious bleedings and aſtringents of any kind. Dr Fothergill obſerves, that various purgations of aloes, the tinctura ſacra, pil. Ruffi, elixir proprietatis, and other compoſitions of this kind, are recommended as proper purgatives to be uſed on the ceſſation of the menſes. But many inconveniences have ariſen from theſe heating medicines, as the piles, ſtrangury, immoderate diſcharges of the menſes, racking pains in the loins, and other ſimilar complaints. Rhubarb, ſena, magneſia, ſulphur medicines, ſmall doſes of jalap, and various combinations of theſe, may be ſubſtituted in the room of the others, and will ſupply ſufficient variety to the preſcriber and patient. When the menſes are about to go off, they appear for the moſt part irregularly both in time and quantity; once in a fortnight, three, five, or ſix weeks; ſometimes very ſparingly, at other times in immoderate quantities. Great loſſes of this kind are often prevented by taking away four or five ounces of blood a few days after the firſt menſtrual ſuppreſſion. If a patient has in early life been ſubject to cutaneous eruptions, ſore eyes, glandular ſwellings, or other obvious marks of morbid humours ſubſiſting in the conſtitution, and all which may have diſappeared about the time the menſes became regular, an iſſue is an adviſable drain, and may prevent many inconveniences. If at this time ulcerous ſores break out about the ancles, or in other parts of the body, they ought to be continued open, or artificial drains ſubſtituted in their ſtead; for thoſe who will have them dried up are ſoon after carried off by acute diſeaſes, or fall into thoſe of a chronic nature.

MENSORES, among the Romans, were harbingers, whoſe buſineſs it was to go before the emperor, and fix upon lodgings for him when he travelled into any of the provinces. They alſo marked out encampments, and aſſigned every regiment its poſt.

Menſores were alſo land-ſurveyors, architects, or appraiſers of houſes and public buildings. The diſtributors of proviſions in the army were called *menſores frumentarii*. And menſores was alſo an appellation given to ſervants who waited at table.

MENSTRUAL, or Menstruous, a term in medicine, applied to the blood which flows from women in their ordinary monthly purgations. See Menses.

MENSTRUUM, in chemiſtry, any body which in a fluid or ſubtiliſed ſtate is capable of interpoſing its ſmall parts betwixt the ſmall parts of other bodies, ſo as to divide them ſubtilly and form a new uniform compound of the two.

MENSURATION, in general, denotes the act or art of meaſuring lines, ſuperficies or ſolids. See Geometry.

MENTHA, mint, in botany: A genus of the gymnoſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 42d order *Verticillatæ*. The corolla is nearly equal, and quadrifid, with one ſegment broader than the reſt, and emarginated; the ſtamina are erect, ſtanding aſunder. There are many ſpecies; but not more than three are cultivated for uſe, namely, the viridis or common ſpearmint, the piperita or peppermint, and the pulegium or pennyroyal. All theſe are ſo well known as to need no deſcription; and all of them are very eaſily propagated by cuttings, parting the roots, or by offsets.

Uſes. For culinary purpoſes, the ſpearmint is preferable to the other two; but for medicine, the peppermint and pennyroyal have in ſome places almoſt entirely ſuperſeded it. A conſerve of the leaves is very grateful, and the diſtilled waters both ſimple and ſpirituous are univerſally thought pleaſant. The leaves are uſed in ſpring ſallads; and the juice of them boiled up with ſugar is formed into tablets. It has been imagined that cataplaſms and fomentations of mint, would diſſolve coagulations of milk in the breaſts; but Dr Lewis ſays, that the curd of milk, digeſted in a ſtrong infuſion of mint, could not be perceived to be any otherwiſe affected than by common water: however, milk, in which mint-leaves were ſet to macerate, did not coagulate near ſo ſoon as an equal quantity of the ſame milk kept by itſelf. Dr Lewis ſays, that dry mint digeſted in rectified ſpirits of wine, gives out a tincture, which appears by day-light of a fine dark green, but by candle-light of a bright red colour. The fact is, that a ſmall quantity of this tincture is green either by day-light or by candle-light, but a large quantity of it ſeems impervious to common day-light; however, when held betwixt the eye and a candle, or betwixt the eye and the ſun, it appears red.

The virtues of mint are thoſe of a warm ſtomachic and carminative: in loſs of appetite, nauſea, and continual retching to vomit, there are few ſimples of equal efficacy. In colicky pains, the gripes to which children are ſubject, lienteries, and other immoderate fluxes, this plant frequently does good ſervice. It likewiſe proves beneficial in many hyſteric caſes, and affords an uſeful cordial in languors and other weakneſſes conſequent upon delivery. The beſt preparation in theſe caſes is a ſtrong infuſion of the dried herb in water (which is much ſuperior to the green), or rather a tincture or extract prepared with rectified ſpirit. Theſe poſſeſs the whole virtues of the mint; the eſſential oil and diſtilled water contain only the aromatic part; the expreſſed juice only the aſtringency and bitteriſhneſs, together with the mucilaginous ſubſtance common to all vegetables. The peppermint is much more pungent than the others.

Pennyroyal has the ſame general characters with the mint, but is more acrid and leſs agreeable when taken into the ſtomach. It has long been held in great eſteem, and not undeſervedly, as an aperient and deobſtruent, particularly in hyſteric complaints and ſuppreſſions of the menſes. For theſe purpoſes the diſtilled water is generally made uſe of, or, what is of equal efficacy, an infuſion of the leaves. It is obſervable, that both water and rectified ſpirit extract the virtues of this herb by infuſion, and likewiſe elevate the greateſt part of them by diſtillation. The expreſſed juice, with a little ſugar, is not a bad medicine in the chincough.

MENTOR (fab. hiſt.), a faithful friend of Ulyſſes; a ſon of Hercules; a king of Sidonia, who revolted againſt Artaxerxes Ochus, and afterwards was reſtored to favour by his treachery to his allies, &c. *Diod.* 16. An excellent artiſt in poliſhing cups and engraving flowers on them. *Plin.* 33. c. 11.—*Mart.* 9. ep. 60. v. 16.

MENTZ, an archbiſhopric and electorate in Germany. It lies on the banks of the river Meyne, between the electorate of Triers on the weſt, the Palatinate on the ſouth, Franconia on the eaſt, and the Wetteraw

Mentz.

on the north. It is about 60 miles in length from north-eaſt to ſouth-weſt, and about 50 in breadth. A conſiderable part of the elector's revenue ariſes from the toll on the Rhine and the Mayne, and from the tax on the excellent wines produced in this country. The chief towns of any trade are, 1. Mentz; (ſee the next article.) In its neighbourhood is Heckheim, ſo celebrated for good wines, that the beſt Rheniſh is from thence called *old hock*. It is a pretty village, containing about 300 families; and belongs to the chapter of Mentz, the dean of which enjoys the revenue of it: in a good year he makes from twelve to fifteen thouſand guilders of his wine. He and the Auguſtines of Mentz and Francfort have the excluſive enjoyment of the beſt Hockheimer wine, of which, in good years, a piece, conſiſting of 100 meaſures, ſells for from 900 to 1000 guilders from the preſs. "This (ſays the Baron Rieſbeck) is certainly one of the deareſt wines in the world. Having a deſire to taſte it on the ſpot, we were obliged to pay a rix-dollar; it was, however, of the beſt vintage in this century, viz. that of 1766. Nor ſhould we have had it, but for an advocate of Mentz, to whom the hoſteſs meant to ſhow favour. This was the firſt German wine I had met with which was entirely without any ſour taſte: it was, quite a perfume to the tongue; whereas the other wine of Hockheim, let it be as good as it may, is not quite clear of vinegar; though for this alſo, if it has any age, you are forced to pay a guilder and a half." 2. Bingen is a pleaſant town, which ſtands in the diſtrict called *Rhinegau*. This town, which, together with the toll on the Rhine, is worth about 30,000 guilders, belongs to the chapter of Mentz, is extremely beautiful, and contains about 4500 inhabitants. A great part of the corn which is carried into the Rhinegau from the neighbouring Palatinate, comes through this place, which, on the other hand, ſupplies the Palatinate with drugs, and various foreign commodities. This traffic alone would make the place very lively; but beſides this, it has very fruitful vineyards. The hill, at the foot of which it lies, and one ſide of which is made by the gullet, through which the Nahe runs into the Rhine, forms another ſteep rock behind this gullet parallel to the Rhine and the golden Rudeſheimer mountain; it therefore enjoys the ſame ſun as this does, which makes the Rudeſheimer wine that grows on it little inferior to the Rudeſheimer. See Rudesheim. The riſing grounds about it produce wines that are eſteemed preferable to thoſe of Baccharach, ſo much in vogue heretofore.—2. Elfeld, five miles weſt from Mentz, is a ſtrong fortified town, on the north-ſide of the Rhine, and the chief of the Rhinegau.—Here is Rudeſheim, a place noted for the growth of the beſt wines in theſe parts. 4. Weiſbaden lies between ſix and ſeven leagues from Francfort, and about five or ſix miles north of Mentz; it is the metropolis of a country belonging to the branch of Naſſau-Saarbrak, and is famous for its mineral waters.

After the pope, there is no doubt but the archbiſhop of this place is the moſt conſiderable and richeſt prelate in the Chriſtian world. According to Baron Rieſbeck, the ſee is indebted for its increaſe of riches to St Boniface, who may be called, with great juſtice, the apoſtle of the Germans. It was this man, an Engliſhman by birth, who in the time of Charlemagne baptized Witikind and the other brave Saxons who had ſo long reſiſted baptiſm with their ſwords, and ſpread the empire of the vicar of Jeſus Chriſt as far as the northern and eaſtern ſeas. He it was who introduced the Roman liturgy into Germany, and made the ſavage inhabitants abſtain from eating horſe's fleſh. He raiſed the papal power to a higher pitch than it had been raiſed in any other country in Chriſtendom; and, in recompence of his ſervices the pope made all the new-founded biſhoprics in the north of Germany ſubject to the ſee of Mentz, which Boniface had choſen for his reſidence. The provinces, the moſt conſiderable in the whole papal dominions, all Swabia, Franconia, Bohemia, and almoſt all Saxony, with a part of Switzerland, Bavaria, and the upper Rhine, belong to this dioceſe. Though the reformation, and revenge of the kings of Bohemia, have leſſened it one third, it ſtill contains the archbiſhopric, of Sprengel and eleven biſhoprics, moſt of which are the moſt conſiderable of Germany, as Wurzburg, Paderborn, Hildeſheim, Augſbourg, &c. When the building of the papal monarchy was completed by Gregory VII. the archbiſhops of Mentz became powerful enough to be at the head of the empire. In the 13th and 14th centuries, they were ſo eminent as to be able to make emperors without any foreign aſſiſtance; and it was to one of them that the houſe of Hapſburg was indebted for its firſt elevation. Since the boundaries of the two powers have been more accurately aſcertained, and the temporal has ſo much got the better of the ſpiritual, the power and influence of the archbiſhops of this place have of courſe been much reduced; ſtill, however, they are poſſeſſed of very important prerogatives, which they might exert with much more efficacy than they do, were it not that various circumſtances have rendered them too dependant on the emperors. They are ſtill the ſpeakers in the Electoral College, have the appointment of the diets under the emperors, and may order a re-examination of the proceedings of the imperial courts. Theſe high privileges are, however, too much ſubject to the controul of the houſe of Auſtria; nor are their ſpiritual powers any longer what they once were. Their ſuffragan biſhops have taken it into their heads that all biſhops are alike as to power, and that the title of archbiſhop only intitles its poſſeſſor to the firſt place amongſt brothers who are equal. The temporals, however, which are ſtill annexed to this chair, make him who ſits in it rich amends for the diminution of his ſpiritual and political ſplendor. Though he does not abſolutely poſſeſs the largeſt, yet he certainly has the richeſt and moſt peopled domain of any eccleſiaſtical potentate in Germany. The country, it is true, does not contain more than 125 German miles ſquare, whereas the archbiſhopric of Saltzburg contains 240; but then Saltzburg has only 250,000 inhabitants, whereas Mentz has 320,000. The natural riches of the territory of Mentz, and its advantageous ſituation, make a ſubject of Mentz much richer than one of Saltzburg, the greateſt part of which is only inhabited by herdſmen. In the territory of Mentz there are 40 cities; in that of Saltzburg only ſeven. The tax on veſſels which go down the Rhine of itſelf produces 60,000 guilders, or 6000 l. a year, which is nearly as much as all the mines of Saltzburg put together, excepting only the ſalt mine at Halle. The tax on wine, here and in the country round, produces the court above 100,000 guilders, or 10,000 l. a-year in which ſum we do not reckon the cuſtoms of the countries which lie at a greater diſtance. Upon the whole, the income of the preſent archbiſhop may be valued at 1,700,000 guilders, or 1700,000 l.

If the lands of the elector lay all together, they would produce a ſufficiency of corn and all the prime neceſſaries of life; but as ſeveral parts of them lie wide aſunder, the people are compelled to purchaſe a great deal from foreigners. The capital itſelf, as well as the adjacent Rhinegau, depends on the Palatinate for its corn, notwithſtanding the great abundance of that and every other ſpecies of grain in its own poſſeſſions in Wetterau. The nobleſt production of the elector's territory on the Rhine is the wine, which is almoſt the only true Rheniſh. Connoiſſeures, indeed, allow the wines of Neirſtein, Bacharach, and a very few other places out of this country, to be true Rheniſh: but they do not give this name to the wines of the Palatinate, of Bardon, and of Alſatia. There is a great deal of wine made in the countries which lie on the ſouth and weſt of the Rhine, at Laubenheim, Bodenheim, Budeſheim, and Bingen; but the true Rheniſh, that which inſpires ſo many who are and ſo many who are not poets, comes only from the Rhinegau, which lies on the northern banks of the Rhine. See Rhinegau.

The civil liſt of the archbiſhop (according to Baron Rieſbeck), is by much too immoderate and expenſive. "He has his miniſters, his counſellors of ſtate, and eighty or ninety privy counſellors of various denominations. The expence of this eſtabliſhment is very diſproportionate to the revenue of the ſtate. This is owing to the large number of poor nobility, who can only accept of employments of this kind. Ignorance of the true principles of government are the cauſes of this evil. The conſequences are, that a great number of perſons, who might be uſefully employed, live in idleneſs. Even the military eſtabliſhment of the country appears to be more calculated for the purpoſe of feeding a hungry nobility than for real uſe. At the acceſſion of the preſent elector, though the whole army only conſiſted of 2200 men, there were ſix generals. The regular eſtabliſhment paid for and ſupported by the country is 8000 men; but though there are only 2000 men kept up, the money expended for their ſupport, particularly that given to numberleſs uſeleſs officers, might be made uſe of more for the benefit of the country. The army of the archbiſhop conſiſts of a German guard of 50 men and 25 horſes, a Swiſs guard, a ſquadron of huſſars of 130 men (the moſt uſeful troops, as they purge the land of robbers and murderers), a corps of artillery of 104 men, three regiments of infantry of 600 men each, and ſome companies belonging to the armies of Franconia and the Upper Palatinate. Of the fortifications of the capital we may ſay much the ſame as of the army. Were they, indeed, improved and kept up as they ought to be, they would vie with Luxemburg, and be the moſt powerful of all the barriers againſt France. It is true, that the nature of ground does not allow of a regular plan; but for ſingle parts, I have ſeen no place of the ſame capabilities, where greater advantages have been taken of the ground for the erection of the ſeveral works. The beauty, as well as ſize of them, is indeed an object of great wonder; but though the circle of the Upper Rhine, and even the empire in general, has laid out great ſums on the building theſe fortifications, parts of them are not finiſhed, and parts of them are ready to fall to pieces. Their extent, indeed, would require a great army to man them. But this, as well as the maintaining and keeping them up, is evidently beyond the power of this country, or indeed of the whole circle of the Upper Rhine united. They are, therefore, alſo to be looked upon as one of the things which ſerve more for magnificence than real uſe."

Mentz, a conſiderable town of Germany, in the circle of the Lower Rhine, and capital of the electorate of the ſame name, is ſituated on the Rhine near its confluence with the Mayne, 20 miles north-weſt of Worms, 15 weſt of Francfort, and 75 eaſt of Triers, in E. Long. 8. 20. N. Lat. 49. 51. This city claims a right to the invention of the art of printing: (ſee *Hiſtory of Printing*). Here is a very beautiful quay along the river, defended by ſeveral works well fortified with cannon. That part of the city which extends towards the river is moſt populous. The beſt vineyards for Rheniſh wine being in this neighbourhood. Mentz has a flouriſhing trade in that commodity more particularly; and its commerce is the briſker, by reaſon that all the merchandize which paſſes up and down the Rhine ſtops in its harbour to change bottoms.

The northern part of the city, in which the archbiſhop reſides, is full of very regular buildings. Here are three regular ſtreets, called the *Blerchen*, which run parallel to each other from the bank of the Rhine to 600 yards within the city, and are cut almoſt regularly by very pretty croſs ſtreets. The archbiſhop's palace has a moſt commanding view of theſe ſtreets, the Rhine and the Rhinegau. There are alſo ſome good buildings in the old part of the city. The market of beaſts is extremely well worth ſeeing: and you here and there meet with other agreeable ſpots. The market in the middle of the town, though not regular, is one of the prettieſt places in Germany. The cathedral is well worth notice. It is an immenſe large old Gothic building, the ſpire of which was ſtruck with lightning about 20 years ago, and entirely laid in aſhes. As it was made of a foreſt of wood; it burned 14 hours before it was entirely conſumed. To prevent theſe accidents for the future, the chapter had the preſent one built to the ſame height in ſtone, an undertaking which coſt them 40,000 guilders or L. 4000. It is a great pity (Baron Rieſbeck obſerves) that it is overloaded with ſmall ornaments; and a ſtill greater, that this wonderful edifice is ſo choaked up with ſhops, and houſes as to be hardly more than half viſible. As, however, houſes and ſhops are very dear in this part of the town, one cannot be very angry with the chapter for chooſing rather to make the moſt of its ground than to ſhow off the church to the beſt advantage. The rent of a ſhop and a ſingle room to live in is 150 guilders or L. 15 per annum in this part of the town.

There is hardly another church in Germany of the height and length of this cathedral; and the inſide of it is decorated with ſeveral magnificent monuments of princes and other great perſonages. Beſides the cathedral, the city of Mentz contains ſeveral other churches in the modern ſtyle, very well worth ſeeing. St Peter's, and the Jeſuits church, though both too much loaded with ornament, are among this number. The church of the Auguſtines, of which the inhabitants of Mentz are ſo proud, is a maſter-peice of bad taſte; but that of Ignatius, though little is ſaid about it, would be a model of the antique, if here likewiſe there had not been too much ornament laviſhed. Upon the whole, the palaces of the nobleſſe want that noble ſimplicity which alone conſtitutes true beauty and magnificence. In another century the externals of the city will be quite changed. The late prince built a great deal, and the preſent has a taſte for the ſame ſort of expence. The monks and governors of hoſpitals alſo have been forced to rebuild their houſes; ſo that when a few more ſtreets are made broader and ſtraighter, the whole will have no bad appearance. The inhabitants, who together with the garriſon amount to 30,000, are a good kind of people, and, like all the catholics of Germany, make great account of a good table. Their faces are intereſting, and they are not deficient either in wit or activity.

There are few cities in Germany beſides Vienna which contain ſo rich and numerous a nobility as this does; there are ſome houſes here which have eſtates of 100,000 guilders, or L. 10,000 a-year. The counts of Baſſenheim, Schonborn, Stadion, Ingelheim, Elz, Oſtein, and Walderdorf, and the lords of Dahlberg, Breitenbach, with ſome others, have incomes of from 30,000 to 100,000 guilders. Sixteen or eighteen houſes have from 15,000 to 30,000 guilders annual revenue.—The nobility of this place are ſaid to be ſome of the oldeſt and moſt untainted in Germany. There are amongſt them many perſons of extraordinary merit, who join uncommon knowledge to all the duties of active life. Upon the whole, they are far ſuperior to the greater part of the German nobility. Their education, however, is ſtill too ſtiff. The firſt miniſter of the court was refuſed admittance into their aſſemblies for not being ſufficiently noble; and they think they degrade themſelves by keeping company with bourgeois.

The clergy of this place are the richeſt in Germany. A canonry brings in 3500 Rheniſh guilders in a moderate year. The canonry of the provoſt brings him in 40,000 guilders a-year; and each of the deaneries is worth 2600 guilders. The income of the chapter altogether amounts to 300,000 guilders. Though it is forbidden by the canons of the church for any one to have more than a ſingle prebend, there is not an eccleſiaſtic in this place but what has three or four; ſo that there is hardly a man amongſt them who has not at leaſt 8000 guilders a-year. The laſt provoſt a count of Elts, had prebends enough to procure him an income of 75,000 guilders. Excluſive of the cathedral, there are ſeveral other choirs in which the canonries bring in from 1200 to 1500 guilders a-year. To give an idea of the riches of the monaſteries of this place, Baron Rieſbeck informs us, that at the deſtruction of the Jeſuits, their wine, which was reckoned to ſell extremely cheap, produced 120,000 rixdollars. A little while ago the elector aboliſhed one Carthuſian convent and two nunneries, in the holy cellars of which there was found wine for at leaſt 500,000 rixdollars. "Notwithſtanding this great wealth (continues our author), there is not a more regular clergy in all Germany. There is no dioceſe in which the regulations made by the council of Trent have been more ſtrictly adhered to than they have here; the archbiſhops having made a particular point of it both at the time of the reformation and ever ſince. One thing which greatly contributes to keep up diſcipline is the not ſuffering any prieſt to remain in the country who has not fixed and ſtated duties, and a revenue annexed to them. Moſt of the irregularities in Bavaria, Auſtria, and other countries, ariſe from abbés who are obliged to ſubſiſt by their daily induſtry and any maſſes which they can pick up. Theſe creatures are entirely unknown here. The theological tenets of this court are alſo much purer than thoſe of any other eccleſiaſtical prince in Germany. I was pleaſed to ſee the Bible in the hands of ſo many common people, eſpecially in the country. I was told that the reading of it was not forbidden in any part of the dioceſe; only perſons, were enjoined not to read it through without the advice of their confeſſors. For a long time ſuperſtition has been hunted through its utmoſt receſſes; and though it is not quite poſſible to get entirely clear of pilgrimages and wonder-working images, you will meet with no prieſt bold enough to exorciſe or to preach ſuch nonſenſe as we hear in the pulpits of other German churches."

Though the trade of this place has been conſtantly on the increaſe for theſe 18 or 20 years paſt, yet it is by no means what it ought to be from the ſituation and other advantages. The perſons here who call themſelves merchants, and who make any conſiderable figure, are in fact only brokers, who procure their livelihood at the expence of the country or territory round, or who act for the merchants of Francfort. A few toy-ſhops, five or ſix druggiſts, and four or five manufacturers of tobacco, are all that can poſſibly be called traders. There is not a banker in the whole town; and yet this country enjoys the ſtaple privilege, and commands by means of the Mayne, Necker, and Rhine, all the exports and imports of Alſatia, the Palatinate, Franconia, and a part of Suabia and Heſſe, as far as the Netherlands. The port too is conſtantly filled with ſhips, but few of them contain any merchandize belonging to the inhabitants of the place.

MENTZEL (Chriſtian), born at Furſtenwall in the Mittel-mark, is celebrated for his ſkill in medicine and botany, in purſuit of which he travelled through many countries. He had correſpondents in the moſt diſtant parts of the world. He died A. D. 1701, about the 79th year of his age. He was a member of the academy *des Curieux de la Nature*. His works are, 1. *Index nominum plantarum*, printed at Berlin in folio, 1699; and reprinted with additions in 1715, under the title of *Lexicon plantarum polyglotton univerſale*. 2. A Chronology of China, in German, printed at Berlin, 1696 in 4to. The following manuſcripts of his compoſition are preſerved in the royal library at Berlin, 1. *Sur l'Hiſtoire Naturelle du Braſil*, in four volumes folio.

lio. 2. *Sur les Fleurs et les Plantes du Japon*, with coloured plates, two vols folio.

MENUS (anc. geog.), a river of Germany; now the *Maine*, riſing in Franconia, and running from eaſt to weſt into the Rhine at Mentz.

MENUTHIAS (anc. geog.), an iſland adjoining to the north-eaſt of the promontory Praſum of Ethiopia beyond Egypt. Some take it to be *Madagaſcar*, or the iſland of *St Laurence*. Iſaac Voſſius will have it to be *Zanzibar*; Madagaſcar being at a greater diſtance from the continent than the ancients ever failed to, whereas Menuthias was nearer: yet though Zanzibar be nearer the continent, it is however nearer the equator than Ptolemy's Menuthias, placed in ſouth latitude 12½ degrees.

MENYANTHES, MARSH-TREFOIL, or *Buckbean*: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 21ſt order, *Preciæ*. The corolla is hairy; the ſtigma bifid; the capſule unilocular. This plant grows wild in moiſt marſhy places in many parts of Britain. It has three oval leaves ſtanding together upon one pedicle; which iſſues from the root; their taſte is very bitter, and ſomewhat nauſeous. According to Mr Lightfoot, the flowers of this plant are ſo extremely beautiful, that nothing but their native ſoil could exclude it from a place in every garden. They grow in an elegant ſpike; are white, daſhed with pink, and fringed internally with hairs. The Highlanders eſteem an infuſion or tea of the leaves as good to ſtrengthen the ſtomach. According to Dr Withering, an infuſion of the leaves is preſcribed in rheumatiſms and dropſies; a dram of them in powder purges and vomits, and is ſometimes given to deſtroy worms. In a ſcarcity of hops, the plant is uſed in the north of Europe to bitter the ale. The powdered roots are ſometimes uſed in Lapland inſtead of bread, but they are unpalatable. Some people ſay, that ſheep will eat it, and that it cures them of the rot; but from the Upſal Experiments it appears, that though goats eat it, ſheep ſometimes will not. Cows, horſes, and ſwine, refuſe it.—Dr Lewis informs us, that it is an efficacious aperient and deobſtruent; promotes the fluid ſecretions; and, if liberally taken, gently looſens the belly. It has of late gained great reputation in ſcorbutic and ſcrophulous diſorders; and its good effects in thoſe caſes have been warranted by experience. Inveterate cutaneous diſeaſes have been removed by an infuſion of the leaves, drank to the quantity of a pint a-day, at proper intervals, and continued for ſome weeks. Boerhaave relates, that he was relieved of the gout by drinking the juice mixed with whey.

MENZIKOFF (Alexander), was originally an apprentice to a paſtry-cook near the palace of Moſcow; but by a fortunate circumſtance was drawn from that ſituation in early life, and placed in the houſehold of Peter the Great. Having made himſelf maſter of ſeveral languages, and being formed for war and for buſineſs, he firſt rendered himſelf agreeable, and afterwards became neceſſary to his maſter. He aſſiſted Peter in all his projects; and was rewarded for his ſervices with the government of Ingria, the rank of prince, and the title of *major-general*. He ſignalized himſelf in Poland in 1708 and 1709; but in 1713 he was accuſed of embezzling the public money, and fined in 300,000 crowns. The Czar remitted the fine; and having reſtored him to favour, gave him the command of an army in the Ukraine in 1719, and ſent him as his ambaſſador into Poland in 1722. Conſtantly employed about the means of preſerving his influence after the death of his maſter, who was then evidently on the decline, Menzikoff diſcovered the perſon to whom the Czar intended to leave the ſucceſſion. The emperor was highly offended, and his penetration coſt him the principality of Pleſcoff. Under the Czarina Katharine, however, he was higher in favour than ever; becauſe, on the death of the Czar in 1725, he was active in bringing different parties in Ruſſia to agree to her ſucceſſion. This princeſs was not ungrateful. In appointing her ſon-in-law Peter II. to be her ſucceſſor, ſhe commanded him to marry the daughter of Menzikoff, and gave the Czar's ſiſter to his ſon. The parties were actually betrothed; and Menzikoff was made duke of Cozel and grand-ſteward to the Czar. But this ſummit of elevation was the prelude to his fall. The *Dolgoroukis*, favourites of the Czar, had influence enough to procure his baniſhment, together with that of his family, to one of his own eſtates at the diſtance of 250 leagues from Moſcow. He had the imprudence to leave the capital with the ſplendor and magnificence of a governor going to take poſſeſſion of his province. His enemies took advantage of this circumſtance to inflame the indignation of the Czar. At ſome diſtance from Moſcow he was overtaken by a detachment of ſoldiers. The officer who commanded them made him alight from his chariot, which he ſent back to Moſcow; and placed him and his whole family in covered waggons, to be conducted into Siberia, in the habit of peaſants. When he arrived at the place of his deſtination, he was preſented with cows and ſheep big with young, and poultry, without knowing from whom he received the favour. His houſe was a ſimple cottage; and his employment was to cultivate the ground, or to ſuperintend its cultivation. New cauſes of ſorrow were added to the ſeverities of exile. His wife died in the journey; he had the misfortune to loſe one of his daughters by the ſmall-pox; and his other two children were ſeized with the ſame diſeaſe, but recovered. He ſunk under his misfortunes, November 2. 1729; and was buried beſide his daughter, in a little chapel which he had built. His misfortunes had inſpired him with ſentiments of devotion, which, amidſt the ſplendor of his former ſituation, he had altogether neglected. His two ſurviving children enjoyed greater liberty after the death of their father. The officer permitted them to attend public worſhip on Sundays by turns. One day when his daughter was returning from the village, ſhe heard herſelf accoſted by a peaſant from the window of a cottage, and to her great ſurprize, recognized in this peaſant the perſecutor of her family, Dolgorouki; who, in his turn, had fallen a ſacrifice to the intrigues of the court. She communicated this intelligence to her brother, who could not behold, without emotion, this new inſtance of the vanity and inſtability of honours and power. Young Menzikoff and his ſiſter were ſoon after recalled to Moſcow by the Czarina Ann; and left Dolgorouki in poſſeſſion of their cottage. He was made captain of the geards, and received the fifth part of his father's poſſeſſions. His ſiſter was appointed maid of honour to the empreſs, and afterwards married to great advantage.

MENZINI (Benedict), a celebrated Italian poet, born at Florence, was, profeſſor of eloquence at the college Della Sapienza at Rome, where he died in 1704. He wrote, 1. The art of poetry. 2. Satires, elegies, hymns, and the Lamentations of Jeremiah. 3. *Academia Tuſculana*, a work in verſe and proſe, which paſſes for his maſterpiece.

MEOTIS, or Palus Meotis, a ſea of Turky, which divides Europe from Aſia; extending from Crim Tartary to the mouth of the river Don or Tanais.

MEPHITIC, a name expreſſing any kind of noxious vapour; but generally applied to that ſpecies of vapour called *fixed air*. See Air, Fixed *Air*, Gas, &c.

MEPHITIS Fanum, a temple erected to the goddeſs Mephitis, near Lacus Amſancti; who was worſhipped alſo at Cremona. Figuratively, *Mephitis* denotes a noiſome or peſtilential exhalation, (Virgil.)

MEQUINEZ, or Miquinez, the northern capital of the Morocco empire, ſtands at the extremity of the province of Beni-Haſſen, 80 leagues north from the city of Morocco (which is the ſouthern imperial city), and 20 to the eaſt of Salee and the ocean. Maknaſſa, its founder, built it firſt at the bottom of a valley; but Muley Iſmael extended it conſiderably over the plain that lies to the weſt of the valley. It is ſurrounded with well cultivated fields and hills, adorned with gardens and olive plantations, and abundantly watered with rivulets. Accordingly, fruits and kitchen ſtuffs thrive here exceedingly, and even the ſuperior urbanity of the inhabitants announces the temperature of the climate. The winter indeed is very inconvenient, on account of the dirtineſs of the town, the ſtreets not being paved, and the ſoil being ſlimy.

Mequinez is ſurrounded with walls; the palace itſelf is fortified with two baſtions, on which formerly ſome ſmall guns were mounted. Muley Iſmael, and Muley Abdallah, often in this city reſiſted the efforts of the Brebes, the ſworn enemies of their tyranny. To the weſt are ſeen ſome walls of circumvallation, ſix feet in height, which were probably mere intrenchments for the infantry; the attacks of the Brebes being only ſudden and momentary inroads, which did not require a long defence. There is at Mequinez, as well as at Morocco, a walled and guarded ſuburb for the Jews. The houſes are neater here than at Morocco. The Jews here are more numerous; and they can turn their induſtry to greater account, becauſe the Moors in this city are more poliſhed, and (being nearer Europe) more viſited, than thoſe in the ſouthern parts. Near the Jewry, there is another incloſed and ſeparate quarter, called the *Negro-town*. It was built by Muley Iſmael, for the accommodation of thoſe black families which compoſed his ſoldiery. This town is now uninhabited, as are all thoſe deſtined for the ſame uſe through the reſt of the empire.

At the ſouth-eaſt extremity of the city ſtands the palace of the emperor, which was built by Muley Iſmael. The ſpace occupied by this palace is very great; it includes ſeveral gardens, elegantly diſpoſed, and well watered. There is a large garden in the centre, ſurrounded by a vaſt and pretty regular gallery, reſting on columns, which communicates with the apartments. Thoſe of the women are very ſpacious, and have a communication with a large chamber which looks into the garden. As you paſs from one apartment to another, you find at intervals regular courts paved with ſquare pieces of black and white marble; in the middle of theſe courts is a marble baſon, from the centre of which riſes a *jet-d'eau*, and the water falls down into this baſon. Theſe fountains are numerous in the palace; they are uſeful for domeſtic purpoſes, and they ſerve for the ablutions, which the ſcruples of the Mahometans have exceedingly multiplied. The palaces of the Mooriſh kings are large, becauſe they are compoſed only of one range of apartments; theſe are long and narrow, from 18 to 20 feet high; they have few ornaments, and receive the light by two large folding doors, which are opened more or leſs as occaſion requires. The rooms are always lighted from a ſquare court in the centre, which is generally encompaſſed with a colonade.

The Moors here are more courteous than thoſe in the ſouthern parts; they are civil to ſtrangers, and invite them into their gardens, which are very neat. The women in this part of the empire are beautiful; they have a fair complexion, with fine black eyes, and white teeth. I have ſometimes ſeen them taking the air on the terraces; they do not hide themſelves from Europeans, but retire very quickly on the appearance of a Moor.

MERA-de-Asta, formerly a large town of Andaluſia, ſeated on the river Guadaleta, between Arcos and Xeres de la Frontera; but now only a large heap of ruins. Here the Arabs conquered Roderick the laſt king of the Goths, and by that victory became maſters of Spain in 713.

MERCATOR (Gerard), one of the moſt celebrated geographers of his time, was born at Ruremonde in 1512. He applied himſelf with ſuch induſtry to geography and mathematics, that he is ſaid to have frequently forgot to eat and drink. The emperor Charles V. had a particular eſteem for him, and the duke of Juliers made him his coſmographer. He compoſed a chronology, ſome geographical tables, an Atlas, &c. engraving and colouring the maps himſelf. He died in 1594. His method of laying down charts is ſtill uſed, and bears the name of *Mercator's charts*.

Mercator (Nicholas), an eminent mathematician in the 17th century, was born at Holſtein in Denmark; and came to England about the time of the reſtoration, where he lived many years. He was fellow of the Royal Society; and endeavoured to reduce aſtrology to rational principles, as appeared from a MS. of his in the poſſeſſion of William Jones, Eſq. He publiſhed ſeveral works, particularly *Coſmographia*. He gave the quadrature of the hyperbole by an infinite ſeries; which was the firſt appearance in the learned word of a ſeries of this ſort drawn from the particular nature of the curve, and that in a manner very new and abſtracted.

Mercator's Sailing, that performed by Mercator's chart. See Navigation.

MERCATORUM FESTUM, was a feſtival kept by the Roman merchants on the 15th of May in honour of Mercury, who preſided over merchandiſe. A ſow was ſacrificed on the occaſion, and the people preſent ſprinkled themſelves with water fetched from the fountain called *aqua Mercurii*; the whole concluding with prayers to the god for the proſperity of trade.

MERCHANT, a perſon who buys and ſells commodities in groſs, or deals in exchanges; or that traffics in the way of commerce, either by importation or exportation. Formerly every one who was a buyer or ſeller in the retail way was called a *merchant*, as they ſtill are both in France and Holland; but here ſhopkeepers, or thoſe who attend fairs or markets, have loſt that appellation.

Previous to a perſon's engaging in a general trade, and becoming an univerſal dealer, he ought to treaſure up ſuch a fund of uſeful knowledge as will enable him to carry it on with eaſe to himſelf, and without riſking ſuch loſſes as great ill-concerted undertakings would naturally expoſe him to. A merchant ſhould therefore be acquainted with the following parts of commercial learning. 1. He ſhould write properly and correctly. 2. Underſtand all the rules of arithmetic that have any relation to commerce. 3. Know how to keep books of double and ſingle entry, as journals, a leger, &c, 4. Be expert in the forms of invoices, accounts of ſales, policies of inſurance, charter-parties, bills of lading, and bills of exchange. 5. Know the agreement between the money, weights, and meaſures of all parts. 6. If he deals in ſilk, woollen, linen, or hair manufactures, he ought to know the places where the different ſorts of merchandizes are manufactured, in what manner they are made, what are the materials of which they are compoſed, and from whence they come, the preparations of theſe materials before working up, and the places to which they are ſent after their fabrication. 7. He ought to know the lengths and breadths which ſilk, woollen, or hair-ſtuffs, linen, cottons, fuſtains, &c. ought to have according to the ſeveral ſtatutes and regulations of the places where they are manufactured, with their different prices, according to the times and ſeaſons; and if he can add to his knowledge the different dyes and ingredients which form the various colours, it will not be uſeleſs. 8. If he confines his trade to that of oils, wines, &c. he ought to inform himſelf particularly of the appearances of the ſucceeding crops, in order to regulate his diſpoſing of that he has on hand; and to learn as exactly as he can what they have produced when got in for his direction in making the neceſſary purchaſes and engagements. 9. He ought to be acquainted with the ſorts of merchandize found more in one country than another, thoſe which are ſcarce, their different ſpecies and qualities, and the propereſt method for bringing them to a good market either by land or ſea. 10. To know which are the merchandizes permitted or prohibited, as well on entering as going out of the kingdoms or ſtates were they are made. 11. To be acquainted with the price of exchange, according to the courſe of different places, and what is the cauſe of its riſe and fall. 12. To know the cuſtoms due on importation or exportation of merchandizes, according to the uſage, the tariffs, and regulations, of the places to which he trades. 13. To know the beſt manner of folding up, embaling, or tunning, the merchandizes for their preſervation. 14. To underſtand the price and condition of freighting and inſuring ſhips and merchandize. 15. To be acquainted with the goodneſs and value of all neceſſaries for the conſtruction and repairs of ſhipping, the different manner of their building; what the wood, the maſts, cordage, cannons, ſails, and all requiſites may coſt. 16. To know the wages commonly given to the captains, officers, and ſailors, and the manner of engaging with them. 17. He ought to underſtand the foreign languages, or at leaſt as many of them as he can attain to; theſe may be reduced to four, viz. the Spaniſh, which is uſed not only in Spain but on the coſt of Africa, from the Canaries to the Cape of Good Hope: the Italian, which is underſtood on all the coaſts of the Mediterranean, and in many parts of the Levant: the German, which is underſtood in almoſt all the northern countries; and the French, which is now become almoſt univerſally current. 18. He ought to be acquainted with the conſular juriſdiction, with the laws, cuſtoms, and uſages of the different countries he does or may trade to; and in general all the ordinances and regulations both at home and abroad that have any relation to commerce. 19. Though it is not neceſſary for a merchant to be very learned, it is proper that he ſhould know ſomething of hiſtory, particularly that of his own country; geography; hydrography, or the ſcience of navigation; and that he be acquainted with the diſcoveries of the countries in which trade is eſtabliſhed, in what manner it is ſettled, of the companies formed to ſupport thoſe eſtabliſhments, and of the colonies they have ſent out.

All theſe branches of knowledge are of great ſervice to a merchant who carries on an extenſive commerce; but if his trade and his views are more limited, his learning and knowledge may be ſo too: but a material requiſite for forming a merchant is, his having on all occaſions a ſtrict regard to truth, and his avoiding fraud and deceit as corroding cankers that muſt inevitably deſtroy his reputation and fortune.

Trade is a thing of ſo univerſal a nature, that it is impoſſible for the laws of Britain, or of any other nation, to determine all the affairs relating to it: therefore all nations, as well as Great Britain, ſhow a particular regard to the law-merchant, which is a law made by the merchants among themſelves: however, merchants and other ſtrangers are ſubject to the laws of the country in which they reſide. Foreign merchants are to ſell their merchandize at the port where they land, in groſs, and not by retail; and they are allowed to be paid in gold or ſilver bullion, in foreign coin or jewels, which may be exported. If a difference ariſes between the king and any foreign ſtate, the merchants of that ſtate are allowed ſix months time to ſell their effects and leave the kingdom; during which time they are to remain free and unmoleſted in their perſons and goods. See the articles COMMERCE, and *Mercantile Law*.

MERCHET (MERCHETUM), a fine or compoſition paid by inferior tenants to the lord, for liberty to diſpoſe of their daughters in marriage. No baron, or military tenant, could marry his ſole daughter and heir, without ſuch leave purchaſed from the king, *pro* *maritanda filia.* And many of our ſervile tenants could neither ſend their ſons to ſchool, nor give their daughters in marriage, without expreſs leave from the ſuperior lord. See Kennet's Gloſſary *in maritagium.* See alſo Marchet.

MERCIA, the name of one of the ſeven kingdoms founded in England by the Saxons. Though the lateſt formed, it was the largeſt of them all, and grew by degrees to be by far the moſt powerful. On the north it was bounded by the Humber and the Merſey, which ſeparated it from the kingdom of Northumberland; on the eaſt by the ſea, and the territories of the Eaſt-Angles and Saxons; on the ſouth by the river Thames; and on the weſt by the rivers Severn and Dee. It comprehended well nigh 17 of our modern counties, being equal in ſize to the province of Languedoc in France; very little, if at all, leſs than the kingdom of Arragon in Spain; and ſuperior in ſize to that of Bohemia in Germany.

Penda is regarded as its firſt monarch; and the kingdom is thought to derive its name from the Saxon word *merc*, which ſignifies "a march, bound, or limit," becauſe the other kingdoms bordered upon it on every ſide; and not from the river Merſey, as ſome would perſuade us. Penda aſſumed the regal title A. D. 626, and was of the age of 50 at the time of his acceſſion; after which he reigned near 30 years. He was of a moſt furious and turbulent temper, breaking at different times with almoſt all his neighbours, calling in the Britons to his aſſiſtance, and ſhedding more Saxon blood than had been hitherto ſpilled in all their inteſtine quarrels. He killed two kings of Northumberland, three of the Eaſt-Angles, and compelled Kenwall king of the Weſt-Saxons to quit his dominions. He was at length ſlain, with moſt of the princes of his family, and a multitude of his ſubjects, in a battle fought not far from Leeds, by Oſwy king of Northumberland. This battle, which the Saxon chronicle tells us was fought at Winwidfield, A. D. 655, made a great change in the Saxon affairs, which the unbridled fury of Penda had thrown into great confuſion. He had the year before killed Anna king of the Eaſt-Angles in battle, whoſe brother Ethelred notwithſtanding took part with Penda. On the other hand, Penda the eldeſt ſon of Penda, to whom his father had given the ancient kingdom of the Mid-Angles, had two years before married the natural daughter of King Oſwy, and had been baptized at his court. At that time it ſhould ſeem that Oſwy and Penda were upon good terms; but after the latter had conquered the Eaſt-Angles, he reſolved to turn his arms againſt the kingdom of Northumberland. Oſwy by no means had provoked this rupture; on the contrary, Bede tells us that he offered large ſums of money, and jewels of great value, to purchaſe peace: theſe offers being rejected, he was reduced to the neceſſity of deciding the quarrel by the ſword. The river near which the battle was fought overflowing, there were more drowned than killed. Amongſt theſe, as the Saxon chronicle ſays, there were 30 princes of the royal line, ſome of whom bore the title of *kings*; and alſo Ethelred king of the Eaſt-Angles, who fought on the ſide of Penda againſt his family and country.

His ſon Penda, who married the daughter of that conqueror, became a Chriſtian, and was not long after murdered, as is ſaid, by the malice of his mother. His brother Wolfher becoming king of Mercia, embraced in proceſs of time the faith of the Goſpel, and proved a very victorious and potent monarch; and is, with no fewer than ſeven of his immediate ſucceſſors, commonly ſtyled *king of the Anglo-Saxons*, though none of them are owned in that quality by the Saxon chronicle. But though poſſibly none of them might enjoy this honour, they were undoubtedly very puiſſant princes, maintaining great wars, and obtaining many advantages over the ſovereigns of other Saxon ſtates, and eſpecially the Eaſt-Angles, whom they reduced. The extent of the Mercian territories was ſo ample as to admit, and ſo ſituated as to require, the conſtituting ſubordinate rulers in ſeveral provinces; to whom, eſpecially if they were of the royal line, they gave the title of *kings*: which occaſions ſome confuſion in their hiſtory. Beſides the eſtabliſhing epiſcopal ſees and convents, the Saxon monarchs took other methods for improving and adorning their dominions; and as Mercia was the largeſt, ſo theſe methods were moſt conſpicuous therein. Coventry, as being ſituated in the centre, was uſually, but not always, the royal reſidence. Penda, who was almoſt continually in a ſtate of war, lived as his military operations directed, in ſome great town on the frontiers. Wolfher built a caſtle or fortified palace for his own reſidence, which bore his name.—Offa kept his court at Sutton Walls near Hereford.

In each of the provinces there reſided a chief magiſtrate; and if he was of the royal blood, had uſually the title of *king*. Penda, at the time he married Oſwy's daughter, had the title of *king of Leiceſter*.—Ethelred made his brother Merowald king of Hereford; who, dying without iſſue, bequeathed it to his younger brother Mercelm. The like honours were ſometimes conferred upon the princeſſes; and hence, in Mercia eſpecially, we occaſionally read of *vice-queens*. By theſe means the laws were better executed the obedience of the ſubjects more effectually ſecured, and the ſplendor of theſe reſidences conſtantly kept up and augmented.

At length, the crown devolving ſometimes on minors and ſometimes on weak princes, inteſtine factions alſo prevailing, the force of this hitherto mighty kingdom began ſenſibly to decline. This falling out in the days of Egbert, the moſt prudent as well as the moſt potent monarch of the Weſt-Saxons, he took advantage of theſe circumſtances; and having encouraged the Eaſt-Angles to make an attempt for the recovery of their independance, he, in a conjuncture every way favourable to his deſign, broke with the Mercians, and after a ſhort war obliged them to ſubmit. But this was not an abſolute conqueſt, the kings of Mercia being allowed by him and his ſucceſſors to retain their titles and dominions, till the invaſion of the Danes put an end to their rule, when this kingdom had ſubſiſted above 250 years; and when the Danes were afterwards expelled by the Weſt-Saxons, it ſunk into a province, or rather was divided into many.

MERCURIAL, ſomething conſiſting of, or relating to, mercury.

MERCURIALIS (Jerom), an eminent Italian phyſician

Mercurialis.

phyſician, born at Forli in 1530, where he firſt practiſed; but afterwards was profeſſor of medicine ſucceſſively at Padua, Bologna, and Piſa. His writings in phyſic are very numerous; beſides giving an edition of Hippocrates in Greek and Latin, with notes, which, however, did not anſwer the expectations of the learned. He died in 1606; and in 1644 ſome ſelect pieces of his were publiſhed at Venice in one volume folio.

MERCURIALIS, Mercury, in botany: A genus of the enneandria order, belonging to the diœcia claſs of plants; and in the natural method ranking under the 38th order, *Tricoccæ*. The calyx of the male is tripartite; there is no corolla, but nine or twelve ſtamina; the antheræ globular and twin. The female calyx is tripartite; there is no corolla, but two ſtyles; the capſule bicoccous, bilocular, and monoſpermous. There are three ſpecies. 1. The annua, or French mercury, with ſpiked flowers, male and female. This is an annual plant, with a branching ſtalk about a foot high, garniſhed with ſpear-ſhaped leaves of a pale or yellowiſh green colour. The male plants have ſpikes of herbaceous flowers growing on the top of the ſtalks: theſe fall off ſoon; but the female plants, which have teſticulated flowers proceeding from the ſide of the ſtalks, are ſucceeded by ſeeds, which, if permitted to ſcatter, will produce plenty of plants of both ſexes. 2. The perennis mountain, or dog's mercury, with ſpiked and teſticulated flowers, grows under hedges and in woods in many parts of Britain. This has a perennial root, which creeps in the ground; the ſtalks are ſingle, and without branches, riſing 10 or 12 inches high, garniſhed with rough leaves, placed by pairs at each joint of a dark green colour, indented on their edges: theſe have their male flowers growing in ſpikes, upon different plants from thoſe which produce ſeeds. 3. The tomentoſa, or ſhrubby hairy mercury, is a native of the ſouth of France, Spain, and Italy. It has a ſhrubby branching ſtalk, growing a foot and an half high, garniſhed with oval leaves placed by pairs, and covered with a white down on both ſides. The male flowers grow in ſhort ſpikes from the ſide of the ſtalks upon different plants from the firſt. All the ſpecies are eaſily propagated by ſeeds, and are apt to become troubleſome weeds where they have once got a footing.

Properties. The perennis, according to Mr Lightfoot, is of a ſoporific deleterious nature, noxious both to man and beaſt. There are inſtances of thoſe who have eaten it by miſtake inſtead of chenopodium, bonus Henricus, or Engliſh mercury, and have thereby ſlept their laſt. In the iſle of Skye, it is called *lusglenbracadale;* and an infuſion of it is ſometimes taken to bring on a ſalivation; but our author knows not how the experiment anſwers. Tournefort informs us, that the French make a ſyrup of the juice of the annua, two ounces of which is given as a purge; and that they uſe it in peſſaries and clyſters, mixing one quantity of honey to one and a half of the juice. Mr Withering differs greatly from Lightfoot concerning the qualities of the perennis. "This plant (ſays he), dreſſed like ſpinach, is very good eating early in the ſpring, and is frequently gathered for that purpoſe; but it is ſaid to be hurtful to ſheep. Mr Ray relates the caſe of a man, his wife, and three children, who experienced highly deleterious effects from eating it fried with bacon; but this was probably when the ſpring was more advanced, and the plant become acrimonious. Steeped in water, it affords a fine deep blue colour. Sheep and goats eat it; cows and horſes refuſe it.

Mercurification, Mercury.

MERCURIFICATION, in metallurgic chemiſtry, the obtaining the mercury from metallic minerals in its fluid form. For the effecting this, thoſe who have been engaged in theſe reſearches have propoſed three methods. The firſt is by means of a certain mercury, ſo prepared as to have a diſſolving power, by which it could take up the mercuries of metals in the ſame manner as water diſſolves ſalt from aſhes. The ſecond is by means of certain regenerating ſalts, ſuch as ſal ammoniac, which are to detain the more earthy parts of metals, and leave their mercuries ſeparate or ſeparable from them by ſublimation or otherwiſe; and the third method is by means of a large lens or burning-glaſs, in the focus whereof, if any metal be applied, its mercurial part is ſaid to ſeparate and go off in fume, which when collected and condenſed, appears to be running mercury.

The firſt of theſe methods would be very eaſy if the proper mercury were to be readily produced; the ſecond is extremely laborious, and requires much patience and reiteration. But the third ſeems eaſy enough, and practicable to advantage, when a glaſs of three or four feet in diameter is at hand, the ſky ſerene, and the ſun ſhines ſtrong.

For other proceſſes, the reader may conſult Junker's Conſpectus Chemiæ. But theſe mercurified metals, or their mercurial principle rendered ſenſible, are a kind of philoſophical mercury, which although they reſemble ordinary mercury, are nevertheleſs ſaid by perſons exerciſed in ſuch ſtudies, to differ from it conſiderably, by having a greater ſpecific gravity, by more effectually penetrating and diſſolving metals, by a ſtronger adheſion to theſe, and by a leſs volatility.

MERCURY, in natural hiſtory. See Chemistry-*Index*. See alſo Metallurgy, and Quicksilver.

The uſe of mercury in medicine ſeems to have been little known before the 15th century. The ancients looked upon it as a corroſive poiſon, tho' of itſelf perfectly void of acrimony, taſte, and ſmell: there are examples of its having been lodged for years in cavities both in bones and fleſhy parts, without its having injured or affected them. Taken into the body in its crude ſtate, and undivided, it paſſes through the inteſtines unchanged, and has not been found to produce any conſiderable effect. It has indeed been recommended in aſthmas and diſorders of the lungs; but the virtues attributed to it in theſe caſes have not been warranted by experience.

Notwithſtanding the mildneſs and inactivity of crude quickſilver undivided; yet, when reſolved by fire into the form of fume or otherwiſe divided into very minute particles, and prevented from re-uniting by the interpoſition of proper ſubſtances, or combined with mineral acids, it has very powerful effects; affording the moſt violent poiſons, and the moſt excellent remedies with which we are acquainted.

The mercurial preparations, either given internally or introduced into a habit by external application, ſeem to forward circulation through even the minuteſt and moſt remote veſſels of the body ; and may be ſo managed as to promote excretion through all the emunctories. Hence their common uſe in inveterate chronic diſorders, and obſtinate obſtructions of the excretory glands ; in ſcrophulous and cutaneous diſeaſes; and in the venereal lues. If their power be not reſtrained to certain emunctories, they tend chiefly to affect the mouth ; and occaſion a plentiful evacuation from the ſalival glands.

The ſalutary effects of mercurials do not depend on the quantity of ſenſible evacuation. This medicine may be gradually introduced into the habit, ſo as, without occaſioning any remarkable diſcharge, to be productive of very happy effects. To anſwer this purpoſe, it ſhould be given in very ſmall doſes, in conjunction with ſuch ſubſtances as determine its action to the kidneys or the pores of the ſkin. By this method, inveterate cutaneous and venereal diſtempers have been cured, without any other ſenſible excretion than a gentle increaſe of perſpiration or urine. Where there are ulcers in any part, they diſcharge for ſome time a very fetid matter, the quantity of which becomes gradually leſs, and at length the ulcer kindly heals. If the mercury ſhould at any time, from cold, or the like, affect the mouth, it may be reſtrained by omitting a doſe, and by warmth, or ſuitable medicines promoting the perſpiration.

Cooling purgatives are alſo often employed with advantage ; but perhaps the moſt effectual means of giving with ſafety a ſudden check to a mercurial ſalivation, is by the application of a large bliſter to the back.

Mercury, as uſed in medicine, has been employed in a vaſt variety of different forms. But there is reaſon to believe, that every uſeful purpoſe to be anſwered by mercury may be obtained from a very few. The mercurial preparations in general, with a view to their uſe both externally and internally, may be divided into two great claſſes, the mild and the acrid. Almoſt every purpoſe to be anſwered by the former, may be accompliſhed by the unguentum hydrargyri and pilulæ ex hydrargyro of the London and Edinburgh pharmacopœias ; while moſt of the effects to be obtained from the latter may be derived from the proper uſe of thoſe preparations, hitherto generally known under the title of *calomel*, and *corroſive ſublimate mercury*.

The marks of pure mercury are, its globules not loſing their ſpherical figure when poured on wood ; its not communicating a tinge to water, or ſweetneſs to vinegar, when rubbed with them ; its evaporating entirely in an iron ſpoon over the fire ; and its having a ſhining appearance without any pellicle on its ſurface. Mercury is beſt purified by diſtillation in an iron pot, with a long neck bent and immerſed in vinegar.

Quickſilver has ſometimes been uſed in its pure metallic ſtate, with the view of removing obſtructions in the alimentary canal from an idea that it would operate by its weight. But it is ſeldom attended with a good effect, and ſometimes it muſt do harm.

Whole volumes have been written reſpecting its operation and uſe in different diſeaſes, and particularly in venereal affections. Some refer its operation to an evacuant power, others to its operating as a peculiar ſtimulus, and a third ſet to its poſſeſſing a power of deſtroying or neutralizing the venereal virus. Of theſe opinions, the latter is the moſt generally received, and perhaps the beſt founded. But for a more full view of the controverſy, we may refer our readers to late publications on the venereal diſeaſe, and on mercury, by Mr John Hunter, Dr Schwediauer, and Dr Duncan.

In virulent gonorrhœa, it is doubted whether mercury be neceſſary. This diſeaſe is commonly treated like any ſimilar inflammation : and the chief things attended to are cleanlineſs of the parts, a regular belly, and an abſtinence from every thing ſtimulant in food, drink, &c. An injection of oil with calomel, or white precipitate, is much uſed, and ſome prefer a watery ſolution of opium. The more active injections have ſometimes very diſagreeable conſequences.

When the conſtitution is affected, which is known by ulcers on the glands, buboes, ulcers in the mouth or throat, copper-coloured ſpots and ulcers on the ſurface, nodes, &c. mercury is thrown into the body either by friction or by the mouth. The general rule is, to keep up a ſlight ſoreneſs of the gums for ſome ſhort time after the ſymptoms diſappear ; at the ſame time it is to be remembered, that mercury ſometimes continues gleets, and induces ulcers, that are difficultly diſtinguiſhed from venereal ones ; and that theſe laſt only yield to warm bathing, diaphoretic diluents, opiates, country air, and milk diet. Corroſive ſublimate is ſometimes uſed, as more ſpeedily arreſting diſagreeable, ſpreading, or dangerous ulcers ; but the completion of the cure ſhould always be truſted to the mild preparations alone. Mercury is alſo uſed in rabies canina, in worms, in hydrocephalus internus, in tetanus, and is by ſome conſidered as an antidote to the variolous matter.

Mercury, in the heathen mythology. See **Hermes**.

Moſt of the actions and inventions of the Egyptian Mercury have likewiſe been aſcribed to the Grecian, who was ſaid to be the ſon of Jupiter and Maia, the daughter of Atlas. No one of all the heathen divinities had ſo many functions allotted to him as this god : he had conſtant employment both day and night, having been the common miniſter and meſſenger of the whole Pantheon ; particularly of his father Jupiter, whom he ſerved with indefatigable labour, and ſometimes indeed in a capacity of no very honourable kind. Lucian is very pleaſant upon the multitude of his avocations ; and, according to the confeſſion of the emperor Julian, Mercury was no hero, but rather one who inſpired mankind with wit, learning, and the ornamental arts of life, than with courage. The pious emperor, however, omits ſome of his attributes ; for this god was not only the patron of trade, but alſo of theft and fraud.

Amphion is ſaid, by Pauſanias, to have been the firſt that erected an altar to this god ; who, in return, inveſted him with ſuch extraordinary powers of muſic (and maſonry), as to enable him to fortify the city of Thebes in Bœotia, by the mere ſound of his lyre.

Horace gives us the beſt part of his character.

Thou god of wit, from Atlas ſprung,
Who by perſuaſive pow'r of tongue,

And graceful exerciſe, refin'd
The ſavage race of human kind,
Hail! winged meſſenger of Jove,
And all th' immortal powr's above.
Sweet parent of the bending lyre,
Thy praiſe ſhall all its ſounds inſpire.
  Artful and cunning to conceal
Whate'er in ſportive theft you ſteal,
When from the god who gilds the pole,
E'en yet a boy, his herds you ſtole;
With angry voice the threat'ning pow'r
Bade thee thy fraudful prey reſtore;
But of his quiver too beguil'd,
Pleas'd with the theft, Apollo ſmil'd.
  You were the wealthy Priam's guide,
When ſafe from Agamemnon's pride,
Through hoſtile camps, which round him ſpread
Their watchful fires, his way he ſped.
Unſpotted ſpirits you conſign
To bliſsful ſeats and joys divine;
And, pow'rful, with thy golden wand,
The light, unbodied crowd command;
Thus grateful does thy office prove
To gods below, and gods above. *Francis.*

This ode contains the ſubſtance of a very long hymn to Mercury, attributed to Homer. Almoſt all the ancient poets relate the manner in which the Grecian Mercury diſcovered the lyre; and tell us that it was an inſtrument with ſeven ſtrings; a circumſtance which makes it eſſentially different from that ſaid to have been invented by the Egyptian Mercury, which had but three. However, there have been many claimants beſides Mercury to the ſeven-ſtringed lyre. See Lyre.

His moſt magnificent temple was on mount Cylene, in Arcadia. He is deſcribed by the poets as a fair beardleſs youth, with flaxen hair, lively blue eyes, and a ſmiling countenance. He has wings fixed to his cap and ſandals, and holds the caduceus (or ſtaff ſurrounded with ſerpents with two wings on the top) in his hand; and is frequently repreſented with a purſe, to ſhow that he was the god of gain. The animals ſacred to him, were the dog, the goat, and the cock. In all the ſacrifices offered to him, the tongues of the victims were burnt; and thoſe who eſcaped imminent danger ſacrificed to him a calf with milk and honey.

Mercury, ☿ in aſtronomy. See Astronomy, *Index*.

This planet is brighteſt between his elongations and ſuperior conjunction, very near to which laſt he can generally be ſeen. He becomes inviſible ſoon after he has found his elongation, going towards his inferior conjunction; and becomes viſible again a few days before his next elongation. The brightneſs of this planet alters ſometimes very conſiderably in 24 hours. It has been obſerved when leſs than three degrees diſtant from the ſun, and may, perhaps, ſometimes be ſeen even in conjunction with it.

Mercury and Venus appear brighteſt and moſt beautiful in the oppoſite parts of their orbits: the firſt, between his elongations and ſuperior conjunction; and the other, between her elongation and inferior conjunction. Therefore, Venus is ſeen in great perfection as a creſcent, particularly in her inferior conjunction, whilſt Mercury is ſeldom ſeen in ſuch perfect phaſes. Mercury ſhould be always obſerved on or near the meridian. When fartheſt from the ſun, he always appears with a very faint light; and when he has a great ſouth declination, or the atmoſphere is not perfectly clear, he ſeldom can be ſeen in thoſe parts of his orbit, where he only begins to recover his brightneſs, or where it is much diminiſhed. He has frequently been ſeen on the meridian even with a ſmall teleſcope and ſmall power; and it appears from the above ſtatement that he may be obſcured in a clear day rather more than half his orbit, or near one hundred and fourſcore days in the year.

Mercury, in heraldry, a term uſed in blazoning by planets, for the purple colour uſed in the arms of ſovereign princes.

MERCY, a virtue that inſpires us with compaſſion for our brethren, and which inclines us to give them aſſiſtance in their neceſſities. Mercy is alſo taken for thoſe favours and benefits that we receive either from God or man, particularly in the way of forgiveneſs of injuries or of debts. Nothing can be more beautiful than the deſcription of mercy given us by Shakeſpear, in the pleading between Portia and the Jew:

Por. Then muſt the Jew be merciful.
Shy. On what compulſion muſt I? tell me that.
Per. The quality of mercy is not ſtrain'd;
It droppeth as the gentle rain from heav'n
Upon the place beneath. It is twice bleſs'd:
It bleſſeth him that gives, and him that takes.
'Tis mightieſt in the mightieſt; it becomes
The throned monarch better than his crown:
The ſceptre ſhows the force of temporal power,
The atribute to awe and majeſty,
Wherein doth ſit the dread and fear of kings;
But mercy is above this ſcepter'd ſway,
It is enthroned in the hearts of kings;
It is an attribute of God himſelf,
And earthly power doth then ſhow likeſt God's,
When mercy ſeaſons juſtice. Therefore, Jew,
Though juſtice be thy plea, conſider this,
That in the courſe of juſtice none of us
Should ſee ſalvation. We do pray for mercy;
And that ſame prayer doth teach us all to render
The deeds of mercy. *Merchant of Venice*, act iv.

MERCY-SEAT, or Propitiatory, in Jewiſh antiquity, the covering of the ark of the covenant.—The Hebrew name of this cover, which we tranſlate mercy-ſeat, is *Capporeth* (Exod. xxv. 17. 22.), from *Cappor*, which ſignifies *to cover*, *to ſhut up*, *to expiate*, *to pay*. This cover was of gold, and at its two ends were fixed the two cherubims of the ſame metal, which by their wings extended forwards, ſeemed to form a throne for the majeſty of God, who in ſcripture is repreſented to us as ſitting between the cherubims, and the ark itſelf was as it were his footſtool. It was from hence that God gave his oracles to Moſes, or to the high prieſt that conſulted him, (Exod. xxv. 22. Numb. vii. 89.)

MERETRIX, among the Romans, differed from the *proſtibula*. The *proſtibulæ* were common courtezans, with bills over their doors, ſignifying their profeſſion, and were ready at all times to entertain cuſtomers; whereas the *meretrices* entertained none but at night. —The *meretrices* differed in their dreſs from the *matrons;* the former wore the *toga* and ſhort *tunics*, like thoſe of the men: the latter wore the *palla* and the *ſtola* of ſuch a length as to reach to their feet.

MERGANSER. See Mergus.

MERGUS, in ornithology, a genus of birds of the order of anſeres; diſtinguiſhed by having the beak of a cylindrical figure, and hooked at the extremities, and its denticulations of a ſubulated form.

1. The cucullatus, or creſted diver of Cateſby, has a globular creſt, white on each ſide; and the body is brown above and white below. This elegant ſpecies inhabits North America. It appears at Hudſon's Bay the end of May, and builds cloſe to the lakes.—The neſt is compoſed of graſs, lined with feathers from the breaſt; the number of eggs from four to ſix. The young are yellow, and are fit to fly in July.—They all depart from thence in autumn. They appear at New York, and other parts as low as Virginia and Corolina, in November, where they frequent freſh-waters. They return to the north in March; and are called at Hudſon's Bay *Omiſka ſheep*.

Plate CCXCIV.

2. The merganſer, or gooſander, weighs four pounds: its length is two feet four inches; the breadth three feet. The bill is three inches long, narrow, and finely toothed or ſerrated; the colour of that and of the irides is red. The *dun-diver*, or female, is leſs than the male: the head and upper part of the neck is ferruginous; the throat white: the feathers on the hind part are long, and form a pendent creſt: the back, the coverts of the wings, and the tail, are of a deep aſh-colour: the greater quill-feathers are black, the leſſer white; the breaſt and middle of the belly are white, tinged with yellow. The gooſander ſeems to prefer the more northern ſituations to thoſe of the ſouth, not being ſeen in the laſt except in very ſevere ſeaſons. It continues the whole year in the Orkneys: and has been ſhot in the Hebrides in ſummer. It is common on the continent of Europe and Aſia, but moſt ſo towards the north. It is found alſo in Iceland and Greenland, and breeds there, retiring ſouthward in winter, at which time it is found about the lake Baikal. It is frequent in America; inhabits the ſtate of New York in winter; retires from thence in April, probably to Hudſon's Bay; and, if it be the bird called a *Fiſherman-duck*, found alſo in Carolina.

3. The ſerrator, or red-breaſted merganſer, weighs about two pounds: the length is one foot nine inches, the breadth two feet ſeven; the bill is three inches long; the lower mandible red; the upper duſky; the irides a purpliſh red; head and throat a fine changeable black and green; on the former a long pendent creſt of the ſame colour; the tail ſhort and brown; the legs orange-coloured. The head and upper part of the female are of a deep ruſh colour, and the tail aſh-coloured. Theſe birds are moſt frequent in the northern parts of Great Britain. They are obſerved to breed on Loch Mari, in the county of Roſs, and in the iſle of Iſlay. The ſpecies is common in moſt parts of the north of Europe, on the continent; and as high as Iceland, where it is called *Vatus-ond*: alſo in the Ruſſian dominions, about the great rivers of Siberia, and the lake Baikal. It is likewiſe frequent in Greenland in the ſummer, where it breeds on the ſhores. The eggs are like thoſe of a wild duck, but ſmaller and whiter. It dives well, and is very active in the water; but the Greenlanders often take it by darts thrown at it, eſpecially in Auguſt, being the time when it is in moult. It is frequent in Newfoundland, and often appears at Hudſon's Bay in large flocks, but is obſerved to be of a larger ſize there than in Europe. They generally come in pairs the beginning of June, as ſoon as the ice breaks up; make the neſt ſoon after their arrival, chiefly on dry ſpots of ground in the iſlands, and lay from eight to thirteen white eggs, the ſize of thoſe of a duck: the neſt made of withered graſs, and lined with the down of the breaſt. The young are of a dirty brown, like young goſlings. They all depart ſouth in October to the lakes, where they may have open water. They are known at Hudſon's Bay by the name of *As-ſick*.

4. The albellus, or ſmew, weighs about 34 ounces: the length 18 inches, the breadth 26; the bill is near two inches long, and of a lead colour; the head is adorned with a long creſt, white above and black beneath: the head, neck, and whole under part of the body, are of a pure white; the tail is of a deep aſh-colour, the legs of a bluiſh grey. The female *lough-diver*, is leſs than the male: the back, the ſcapulars, and the tail, are duſky; the belly is white. The ſmew is ſeen in England only in winter, at which ſeaſon it will ſometimes be met with at the ſouthern parts of it; as alſo in France, in the neighbourhood of Picardy, where it is called la Piette: ſimilar to this, we have heard it is called in Kent by the name of *magpye-diver*. On the continent we find it as far ſouth as Carniola; frequents alſo Iceland, at which place or ſome other arctic region, it paſſes the ſummer; and where it in courſe breeds, probably along with the other Merganſers; as it has been obſerved to migrate, in company with thoſe birds, ſeveral kinds of ducks, &c. in their courſe up the Wolga, in February. It alſo inhabits America, having been ſent from New-York, where it is probably a migratory ſpecies, as in Europe.

5. The minutus, or redheaded ſmew, weighs about 15 ounces; the length one foot four inches, the breadth one foot eleven: the bill is of a lead colour: the head ſlightly creſted, and of a ruſt colour: the hind part of the neck is of a deep grey, the forepart clouded with a lighter colour of the ſame kind: the back and tail are of a duſky aſh-colour, the legs of a pale aſh-colour.—It is a native of Europe. Birds of this genus (Mr Latham obſerves) "are in general not ſo well-flavoured as thoſe of the duck kind; yet we have often met with the laſt ſpecies in the London markets, and by ſome they are thought to be very little inferior to the wild duck; which laſt now and then partakes of the *fiſhy haut gout*, a flavour not diſagreeable to the palates of the connoiſſeurs in good eating."

MERIAN (Maria Sybylla), a celebrated paintreſs, born at Francfort in 1647, was the daughter of Matthias Merian, a noted engraver and geographer.—As ſhe ſhowed a very early fondneſs for painting, ſhe was inſtructed by Abraham Mignon; from whom ſhe learned great neatneſs of handling and delicacy of colour,

lour. Her genius particularly led her to paint reptiles, flowers, and inſects, which ſhe deſigned after nature, and ſtudied every object with a moſt curious and inquiſitive obſervation; ſo that her works roſe every day more and more into reputation. Frequently ſhe painted her ſubjects in water-colours on vellum, and finiſhed an aſtoniſhing number of deſigns, as ſhe was equally indefatigable in her work and her enquiries into the curioſities of nature. She drew the flies and caterpillars in all the variety of changes and forms in which they ſucceſſively appear from their quieſcent ſtate till they become butterflies; and alſo drew frogs, toads, ſerpents, ants, and ſpiders, after nature, with extraordinary exactneſs and truth. She even undertook a voyage to Surinam, to paint thoſe inſects and reptiles which were peculiar to that climate; and at her return to her own country publiſhed two volumes of engravings after her deſigns, which are well known to the curious. She died in 1717. Her daughter Dorothea Henrietta Graff, who painted in the ſame ſtyle, and had accompanied her mother to Surinam, publiſhed a third volume collected from the deſigns of Sibylla; which complete work has been always admired by the learned, as well as by the profeſſors of painting.

MERIDA, a ſtrong town of Spain, in Eſtremadura, built by the Romans before the birth of Chriſt. Here are fine remains of antiquity, particularly a triumphal arch, but not now what it was formerly. It is ſeated in an extenſive and fertile plain, 47 miles eaſt of Elva, and 45 ſouth by eaſt of Alcantara. W. Lon. 6. 4. N. Lat. 38. 42.

Merida, a town of North America, in New Spain, and capital of the province of Yutacan, where the biſhop and the governor of the province reſide. It is inhabited by Spaniards and native Americans; is 30 miles ſouth of the ſea, and 120 N. E. of Campeachy. W. Lon. 89. 25. N. Lat. 20. 15.

Merida, a town of South America, in the kingdom of New Granada, ſeated in a country abounding with all kinds of Fruits, 130 miles N. E. of Pampeluna. W. Lon. 71. 0. N. Lat. 8. 30.

MERIDEN, or Mireden, a town of Warwickſhire, 97 miles from London, in the London road, near Coventry. It is pleaſantly ſituated, though in a wet clayey ſituation, and is not ill built. The church ſtands on an elevated ſpot, and contains ſome good monuments. There is an inn here, about half way from St Clement's foreſt to Coventry, one of the fineſt in this part of England, being built like a nobleman's ſeat.

MERIDIAN, in geography, a great circle ſuppoſed to be drawn through any part on the ſurface of the earth, and the two poles; and to which the ſun is always perpendicular at noon. See Geography.

In aſtronomy, this circle is ſuppoſed to be in the heavens, and exactly perpendicular to the terreſtrial one. See Astronomy.

MERIDIANI, in antiquity, a name which the Romans gave to a kind of gladiators who entered the arena about noon after the beſtiarii (who fought in the morning againſt beaſts) had finiſhed. They were thus called from *meridies*, i. e. *noon*, the time when they exhibited their ſhews. The meridiani were a ſort of artleſs combatants, who fought man with man, ſword in hand. Hence Seneca takes occaſion to obſerve, that the combats of the morning were full of humanity compared with thoſe which followed.

MERIDIONAL distance, in navigation, the ſame with departure, or eaſting and weſting; being the difference of longitude between the meridian, under which the ſhip now is, and any other meridian which ſhe was under before.

Meridional parts, miles, or minutes, in navigation, are the parts by which the meridians in a Mercator's chart do increaſe, as the parallels of latitude decreaſe.

MERIONETHSHIRE, a county of North-Wales, is bounded on the north by Caernarvonſhire and Denbighſhire; on the eaſt by Montgomeryſhire; on the weſt by St George's channel, or the Iriſh ſea; and on the ſouth by the river Dyffi, which parts it from Cardiganſhire; extending 40 miles in length and 36 in breadth. It is divided into ſix hundreds, in which are four market-towns, 37 pariſhes, about 2590 houſes, and 17,100 inhabitants. It lies in the dioceſe of Bangor, and ſends one member to parliament. The air is very ſharp in winter on account of its many high barren mountains; and the ſoil is as bad as any in Wales, it being very rocky and mountainous. However, this county feeds large flocks of ſheep, many goats, and large herds of horned cattle, which find pretty good paſture in the valleys. Beſides theſe, among their other commodities may be reckoned Welch cotton, deer, fowl, fiſh, and eſpecially herrings, which are taken on this coaſt in great plenty.

MERIT, ſignifies *deſert*. This term is more particularly applied to ſignify the moral goodneſs of the actions of men, and the rewards to which thoſe actions intitle them.

MERLIN (Ambroſe), a famous Engliſh poet and reputed prophet, flouriſhed at the end of the 5th century. Many ſurpriſing and ridiculous things are related of him. Several Engliſh authors have repreſented him as the ſon of an incubus, and as tranſporting from Ireland to England the great ſtones which form Stonehenge on Saliſbury plain. Extravagant prophecies and other works are alſo attributed to him, on which ſome authors have written commentaries.

Merlin, in ornithology. See Falco.

MERLON, in fortification, is that part of a parapet which is terminated by two embraſures of a battery.

MERLUCIUS, the Hake, in ichthyology. See Gadus.

MERMAID, or Merman, a ſea-creature frequently talked of, ſuppoſed half human and half a fiſh.

However naturaliſts may doubt of the reality of *mermen* or *mermaids*, we have teſtimony enough to eſtabliſh it; though, how far theſe teſtimonies may be authentic, we cannot take upon us to ſay. In the year 1187, as Laray informs us, ſuch a monſter was fiſhed up in the county of Suffolk, and kept by the governor for ſix months. It bore ſo near a conformity with man, that nothing ſeemed wanting to it but ſpeech. One day it took the opportunity of making its eſcape; and plunging into the ſea, was never more heard of. *Hiſt. de Angleterre*, P. I. p. 403.

In the year 1430, after a huge tempeſt, which broke down the dikes in Holland, and made way for the ſea into the meadows, &c. ſome girls of the town of Edam in Weſt-Freezeland, going in a boat to milk their cows, perceived a mermaid embarraſſed in the mud, with a very little water. They took it into their boat, and brought it with them to Edam, dreſſed it in womens apparel, and taught it to ſpin. It fed like one of them, but could never be brought to offer at ſpeech. Some time afterwards it was brought to Haerlem, where it lived for ſome years, though ſtill ſhowing an inclination to the water. Parival relates, that they had given it ſome notion of a Deity, and that it made its reverences very devoutly whenever it paſſed by a crucifix. *Delices de Hollande.*

In the year 1560, near the iſland of Manar, on the weſtern coaſt of the iſland of Ceylon, ſome fiſhermen brought up, at one draught of a net, ſeven mermen and mermaids; of which ſeveral Jeſuits, and among the reſt F. Hen. Henriques and Dimas Boſquez, phyſicians to the viceroy of Goa, were witneſſes. The phyſician who examined them with a great deal of care, and made diſſection thereof, aſſerts, that all the parts both internal and external were found perfectly conformable to thoſe of men. See the *Hiſt. de la compagnie de Jeſus*, P. II. T. IV. n° 276. where the relation is given at length.

We have another account of a merman, ſeen near the great rock called the *Diamond*, on the coaſt of Martinico. The perſons who ſaw it, gave in a preciſe deſcription of it before a notary. They affirmed that they ſaw it wipe its hand over its face, and even heard it blow its noſe.

Another creature of the ſame ſpecies was caught in the Baltic in the year 1531, and ſent as a preſent to Sigiſmond king of Poland, with whom it lived three days, and was ſeen by all the court. Another very young one was taken near Rocca de Sintra, as related by Damian Goes. The king of Portugal and the grand maſter of the order of St James, are ſaid to have had a ſuit at law to determine which party theſe monſters belong to.

In Pontopidan's Natural Hiſtory of Norway, alſo, we have accounts of mermaids; but not more remarkable or any way better atteſted than the above.

MERNS, or KINCARDINSHIRE, a county of Scotland, ſtretching 27 miles in length and 20 in breadth, is bounded on the eaſt by the German ocean, on the ſouth by the river of North Eſk, on the weſt by Angus, and on the north by the river Dee and Aberdeenſhire. The country is pretty plain and level, fruitful in corn and paſturage, producing an infinite number of fir-trees, beſides a great number of agreeable plantations; and along the ſea-coaſts there are many convenient creeks and harbours.—The people are Lowlanders, civil, hoſpitable, and induſtrious.—The name *Merns* is by ſome derived from that of a valiant nobleman, who, ſubduing the country, received it in reward from Kenneth II. Cambden ſuppoſes it to retain part of the ancient name of *Vernicones*. The other name is derived from *Kincardin*, its ancient capital, now an inconſiderable village. The ſtocking-trade employs the natives from the banks of the Dee to Stone-hive; from thence to the North Eſk they are wholly employed in weaving.

MERODACH was an ancient king of Babylon, who was placed among the gods, and worſhipped by the Babylonians. Jeremiah (Chap. I. 2.), ſpeaking of the ruin of Babylon, ſays, "Babylon is taken, Bel is confounded, Merodach is broken in pieces, her idols are confounded, her images are broken in pieces." We find certain kings of Babylon, in whoſe names that of Merodach is contained: for example, Evilmerodach and Merodach-baladan. Evilmerodach was the ſon of Nebuchadnezzar the Great, and had for his ſucceſſor the wicked Belſhazzar. Merodach-baladan, ſon of Baladan king of Babylon, having heard that Hezekiah had been cured miraculouſly (Iſa. xxxix.), and that the ſun had gone backwards to give him an aſſurance of his recovery, ſent him preſents, and made him compliments upon the recovery of his health. Ptolemy calls him *Mardocempadus*; and ſays, that he began to reign at Babylon 26 years after the beginning of the era of Nabonaſſar, that is, in the year of the world 2283.

MEROE (anc. geog.), an Iſland of Ethiopia beyond Egypt, in the Nile; with a cognominal town, the metropolis of the Ethiopians.

The Jeſuits have endeavoured to prove, that the province of Gojam in Abyſſinia is the Meroë of the ancients; but this is ſtrongly conteſted by Mr Bruce, who is of opinion that it muſt be looked for ſomewhere between the ſource of the Nile and its union with the Atbara. The latter, he thinks, is very plainly the Aſtaboras of the ancients; and Pliny ſays that this ſtream incloſes the left ſide of Meroë as the Nile does the right, in which caſe we muſt ſuppoſe him looking ſouthward from Alexandria, otherwiſe the words would not apply.

We are told by Diodorus Siculus, that Meroë had its name from a ſiſter of Cambyſes king of Perſia, who died there in the expedition undertaken by that prince againſt the Ethiopians. His army periſhed with hunger and thirſt in the deſerts beyond Meroë; which could not have happened if they had reached Gojam, the latter being one of the moſt plentiful countries in the world. A further proof that Gojam cannot be the ancient Meroë is, that the latter was incloſed between the rivers Nile and Aſtaboras, while Gojam is almoſt entirely ſurrounded by the Nile. If the ancients were acquainted with Gojam, they muſt alſo have been acquainted with the fountains of the Nile, which we certainly know they were not. Pliny ſays that Meroë, the moſt conſiderable of all the iſlands of the Nile, was called *Aſtaboras*, from the name of its left channel, which cannot be ſuppoſed any other than the junction of the Nile and Atbara. He informs us moreover, that the ſun was vertical twice in the year, *viz.* when proceeding northward he entered the 18th degree of Taurus, and when returning he came to the 14th degree of Leo; but this could never be the caſe with Gojam, which lies in about 10 degrees north latitude.

Again, the poet Lucan deſcribes Meroë by two circumſtances which cannot apply to any other than the peninſula of Atbara. One is, that the inhabitants were black; which was the caſe with the Gymnoſophiſts and firſt inhabitants, and which has been the caſe with all the reſt down to the Saracen conqueſt: but the inhabitants of Gojam, as well as the other Abyſſinians, are fair, at leaſt greatly different in complexion from the blacks; they are alſo long haired, and nobody imagined that they ever had philoſophers or ſcience among them, which was eminently the caſe with the ancient inhabitants of Meroë. The other circumſtance is, that the ebony tree grew in the iſland of Meroë, which at this day grows plentifully in the peninſula of Atbara, and part of the province of Kuara, but not in Gojam, where the trees could not ſubſiſt on account of the violent rains which take place during ſix months of the year. Mr Bruce mentions another circumſtance quoted from the poet Lucan, which likewiſe tends to prove the identity of Meroë and Atbara,: viz. that though there are many trees in it, they afford no ſhade. This our traveller found by experience, when returning from Abyſſinia through Atbara; " The country (ſays he) is flat, and has very little water. The foreſt, though thick, afforded no ſort of ſhade, the hunters for the ſake of their ſport, and the Arabs for deſtroying the flies having ſet fire to all the dry graſs and ſhrubs; which paſſing with great rapidity in the direction of the wood from eaſt to weſt, though it had not time to deſtroy the trees, did yet wither, and occaſion every leaf that was upon them to fall, unleſs in thoſe ſpaces where villages had been and where water was. In ſuch ſpots a number of large ſpreading trees remained full of foliage; which from their great height and being cleared of underwood, continued in full verdure, loaded with large, projecting, and exuberant branches. But even here the pleaſure that their ſhade afforded was very temporary, ſo as to allow us no time for enjoyment. The ſun, ſo near the zenith, changed his azimuth ſo rapidly, that every few minutes I was obliged to change the carpet on which I lay, round the trunk of the tree to which I had fled for ſhelter: and though I lay down to ſleep perfectly ſcreened by the trunk or branches, I was preſently awakened by the violent rays of a ſcorching ſun, the ſhade having paſſed beyond me. In all other places, though we had travelled conſtantly in a foreſt, we never met with a tree that could ſhade us for a moment, the fire having deprived them of all their leaves." The heat of Atbara is exceſſive, the thermometer having been obſerved at 119 ½°: two of Mr Bruce's company died of thirſt, or at leaſt of the conſequences of drinking after extreme thirſt. The inhabitants live in the greateſt miſery, and are continually in danger from the neighbouring Arabs, who, by deſtroying and burning their corn, are able to reduce them to a ſtarving condition. Notwithſtanding all their diſadvantages, however, they have a manufacture of courſe cotton towels, of a ſize juſt ſufficient to go round the waiſt, which paſs current as ſilver money throughout the whole country.

MEROM, (anc. geog.) The waters of Merom at which place Jabin and the other confederate kings met to fight Joſhua (xi, 5.),, are generally ſuppoſed by the learned to be the lake Semechon, which lies between the head of the river Jordan and the lake Genneſareth; ſince it is agreed on all hands, that the city Hazor, where Jabin reigned, was ſituated upon this lake. But others think, that the waters of Merom or Merome were ſomewhere about the brook Kiſhon, ſince there is a place of that name mentioned in the account of the battle againſt Siſera (Judg. v. 21.) And it is more rational to think, that the confederate kings advanced as far as the brook Kiſhon, and to a paſs which led into the country, to hinder Joſhua from penetrating it, or even to attack him in the country where he himſelf lay encamped, than to imagine that they waited for him in the midſt of their own country; leaving all Gallilee at his mercy, and the whole tract from the brook Kiſhon to the lake Semechon.

MEROPE (fab. hiſt.) one of the Atlantides. She married Siſyphus the ſon of Æolus, and like her ſiſters was changed into a conſtellation after death. It is ſaid that in the conſtellation of the Pleiades the ſtar of Merope appears more dim and obſcure than the reſt, becauſe ſhe, as the poets obſerve, married a mortal, while her ſiſters married ſome of the gods or their deſcendants.

MEROPS (fab. hiſt.) a king of the iſland of Cos, who married Clymene, one of the Oceanides. He was changed into an eagle, and placed among the conſtellations. Alſo a celebrated ſoothſayer of Percoſus in Troas, who foretold the death of his ſons Adraſtus and Amphius, who were engaged in the Trojan war. They ſlighted their father's advice, and were killed by Diomedes.

MEROPS, in ornithology, a genus belonging to the order of picæ. The bill is crooked, flat, and carinated; the tongue is jagged at the point; and the feet are of the walking kind. 1. The apiaſter, or bee-eater, has an iron-coloured back; the belly and tail are of a bluiſh green; and the throat is yellow. This bird inhabits various parts of Europe, on the continent, though not in England; yet is ſaid to have been ſeen in Sweden, and flocks of them have been met, with at Anſpach in Germany in the month of June. They are now and then ſeen in Lorraine, though only in pairs; and are not unfrequent in other parts ſince Kramer talks of their building the neſt in the ſandy crags of the Danube. They are met with in Italy and the ſouth of France; and in Candia and other iſlands of the Mediterranean, they are in plenty, as well as in Paleſtine and Arabia, being very common in the woods about Yemen, where they are called Schæghagha. It takes the name of *bee-eater* from its being very fond of thoſe inſects; but, beſides theſe, it will catch gnats, flies, cicadæ, and other inſects, on the wing, like the ſwallow. Willoughby tells us, from Belon, " that its ſingular elegancy invites the Candy boys to hunt for it with cicadæ, as they do for thoſe greater ſwallows called *ſwifts* after this manner:—Bending a pin like a hook, and tying it by the head to the end of a thread, they thruſt it through a cicada (as boys bait a hook with a fly), holding the other end of the thread in their hands: the cicada, ſo faſtened, flies nevertheleſs in the air; which the Merops ſpying, flies after it with all her force; and catching it, ſwallows pin and all, wherewith ſhe is caught."—This bird is ſaid to be in moſt plenty in the iſle of Candia; and, in defect of inſects. to eat ſeeds of many kinds; and Ray ſuppoſes, from its ſimilarity to the kingsfiſher, it may poſſibly feed on fiſh. Moſt probably ſome think it good to eat, as Willoughby ſaw many of them expoſed for ſale in the markets of Rome. Theſe birds make their neſts in deep holes in the banks of rivers, like the ſand martin and kingsfiſher, at the end of which the female lays from five to ſeven white eggs, rather leſs than thoſe of a blackbird. The neſt itſelf is compoſed of moſs. 2. The viridis, or Indian bee-eater, is green, with a black belt, on the breaſt; and the throat and tail are black. It inhabits Bengal. 3. The congener is yellowiſh, with a green rump. It inhabits the ſouth of Europe. 4. The ſupercilioſus is green, with a white line both above and below the eyes, and a yellow throat. It is found in Madagaſcar, where the natives give it the name of *Patirich Tirich*. 5. The cinereus is variegated with red and yellow, with the two longeſt quill-feathers of the tail red. It is a native of Mexico. 6. The erythropterus, or red-winged bee-eater, is in length ſix inches; the bill is one inch, and black: the upper parts of the head, body, wings, and tail coverts, are green brown, deepeſt on the head and back, lighteſt on the rump and tail coverts; behind the eye is a ſpot of the ſame, but of a very deep colour: the quills and tail are red, tipped with black; the laſt two inches in length: the throat is yellow; the under parts of the body are a dirty white; and the legs black.—This inhabits Senegal, from which place a well-preſerved ſkin was brought by M. Adanſon. (See fig. A.) 7. The wattled bee-eater (fig. B.) is the ſize of a cuckow, in length about 14½ inches. The feathers on the upper part of the head, being longer than the reſt, give the appearance of a creſt; thoſe of the under part are ſmooth; the plumage for the moſt part is brown; the feathers are long and pointed and each feather has a ſtreak of white down the middle; under the eye, on each ſide, is a kind of wattle, of an orange colour; the middle of the belly is yellow; the tail is wedge-ſhaped, ſimilar to that of the magpie, and the feathers are tipped with white; the bill and legs are brown.—This bird is ſuppoſed to be peculiar to New Holland. There are 14 or 15 other ſpecies.

Plate CCXCIV.

MEROVINGIAN CHARACTER, derives its name from Meroüée, the firſt king of France of that race, which reigned 333 years, from Pharamond to Charles Martel. This race is ſaid by ſome to have terminated in Childeric III. A. D. 751. There are many MSS. in the French libraries ſtill extant in this character.

MEROZ, (anc. geog.), a place in the neighbourhood of the brook Kiſhon, whoſe inhabitants refuſing to come to the aſſiſtance of their brethern when they fought with Siſera, were put under an anathema (Judge, v. 23.) "Curſe ye Meroz, ſays the angel of the Lord; curſe ye bitterly the inhabitants thereof: becauſe, &c." Some have thought that Meroz is the ſame as Merrus or Merom; and this F. Calmet thinks the moſt probable opinion in this matter. Others will have it, that Meroz was a mighty man, who dwelt near the Kiſhon and not caring to come, to the aſſiſtance of Barak and Deborah, was excommunicated by the angel of the Lord by the ſound of 400 trumpets. The angel of the Lord, according to ſome, was Barak, the general of the Lord's army: but according to others he was the high-prieſt for the time being, or a prophet.

MERSA, a town of Barbary, pleaſantly ſituated about 11 miles from the city of Tunis, and two from Melcha the ſite of ancient Carthage. The Bey has here two country-houſes, one of them very coſtly work, built by Haſſan Bey ſurnamed the *Good*. From theſe are orange gardens reaching almoſt to the ſea-ſhore; on the edge of which is a famous well of ſweet water, eſteemed the beſt and lighteſt in the kingdom. Cloſe to this is a coffee-houſe, whither numbers of people from the neighbouring places reſort to drink coffee, and a glaſs of this natural luxury ſo peculiarly enjoyed in the eaſtern countries. In the middle of the court is a large mulberry tree, under the ſhade of which they ſit and ſmoke and play at cheſs; inhaling the comfortable ſea breeze that refreſhes this delightful ſpot. The water is drawn up by a camel with the Perſian wheel.

Here are the remains of an ancient port, or cothou, (ſuppoſed to be an artificial one), built by the Carthaginians after Sapii had blocked up the old port, nothing but the turret or light houſe being left.

MERS or MERSE, a county of Scotland, called alſo *Berwickſhire*. This laſt name it derives from the town of Berwick, which was the head of the ſhire before it fell into the hands of the Engliſh, and obtained the appellation of *Mers* or *March*, becauſe it was one of the borders towards England. It is waſhed on the ſouth and eaſt by the river Tweed and the German Ocean, bounded on the weſt by Tweedale, and on the north by Lothian. It extends 24 miles from eaſt to weſt, and the breadth amounts to 16. The face of the country is rough and irregular, exhibiting hills, moors, and moſſes, with intermediate valleys, which are pleaſant and fruitful. It is watered by many ſtreams; and particularly by the famous Tweed, which riſing from the ſame hills that give birth to the Clyde and Annan, runs with a rapid courſe though Tweedale foreſt and Teviotdale, and after a courſe of 50 miles diſembogues itſelf into the German Ocean. Notwithſtanding the length of its courſe, it is not navigable above Berwick, where there is a noble bridge over it, conſiſting of 15 arches. There is another fine one, called the *Union Bridge*, at Coldſtream. There is a third at Melroſe, a fourth at Peebles, and a fifth at Kelſo. The ſhire of Berwick is generally diſtinguiſhed into the three diviſions of Mers, Lammermuir, and Lauderdale. The Mers is low, pleaſant, and tolerably fruitful in corn. Lammermuir is a hilly country, abounding with game, and yielding good paſture for ſheep and black cattle. Lauderdale is a tract of land lying on each ſide of the river Lauder, agreeably varied with hill, dale, and foreſt, producing good ſtore of corn and paſturage, and giving the title of earl to the family of Maitland: but the moſt fruitful and populous parts of Berwickſhire, are thoſe that lie along the Tweed, and on both ſides of the leſſer rivers White Water, Black Water, and Eye. The ſeats of noblemen and gentlemen abound in this country.

MERSENE (Marin), in Latin *Merſennus*, a learned French author, born at Oyſe, in the province of Maine, anno 1588. He ſtudied at La Fleche at the ſame time with Des Cartes; with whom he contracted a ſtrict friendſhip, which laſted till death. He afterwards went to Paris, and ſtudied at the Sorbonne; and in 1611 entered himſelf among the minims. He became well ſkilled in Hebrew, philoſophy, and mathematics. He was of a tranquil, ſincere, and engaging temper; and was univerſally eſteemed by perſons illuſtrious for their birth, their dignity, and their learning. He taught philoſophy and divinity in the convent of Nevers, and at length became ſuperior of that convent; but being willing to apply himſelf to ſtudy with more freedom, he reſigned all the poſts he enjoyed in his order, and travelled into Germany, Italy, and the Netherlands. He wrote a great number of excellent works: the principal of which are, 1. *Quæſtiones celeberrimæ in Geneſim.* 2. *Harmonicorum libri.* 3. *De ſonorum natura, cauſis, & effectibus.* 4. *Cogita phyſico-mathematica.* 5. *La verite des Sciences.* 6. *Les queſtions inouies.* He died at Paris in 1648. He had the reputation of being one of the beſt men of his age. No perſon was more curious in penetrating into the ſecrets of nature, and carrying all the arts and ſciences to their utmoſt perfection. He was in a manner the centre of all the men of learning, by the mutual correſpondence which he managed between them. He omitted no means to engage them to publiſh their works; and the world is obliged to him for ſeveral excellent diſcoveries, which, had it not been for him, would perhaps have been loſt.

MERSEY, a river of England, that runs through the counties of Lancaſter, York, and Cheſter, and empties itſelf into the Iriſh ſea at Liverpool. By the late inland navigation, it has communication with the rivers Dee, Ribble, Ouſe, Trent, Darwent, Severn, Humber, Thames, Avon, &c.; which navigation, including its windings, extends above 500 miles, in the counties of Lincoln, Nottingham, York, Lancaſter, Weſtmoreland, Cheſter, Stafford, Warwick, Leiceſter, Oxford, Worceſter, &c.

Mersey-Iſland, an iſland of Eſſex, at the mouth of the Coln, ſouth of Colcheſter. It was ſeized by the Danes in the reign of King Alfred, for their winter-quarters. It had eight pariſhes, now reduced to two, viz. eaſt and weſt Merſey. The iſland had a block-houſe; and, in the Dutch war, the parliament put 1000 men in it.

MERULA (George), an Italian of extraordinary parts and learning, born at Alexandria in the duchy of Milan about the year 1420. He taught youth at Venice and Milan for 40 years, and laboured abundantly in reſtoring and correcting ancient authors. He wrote, and addreſſed to Lewis Sforza, *Antiquitates Vicecomitum;* or "The Actions of the Dukes of Milan," in 10 books; with ſome other things in the ſame way. His death, in 1494, is ſaid not to have grieved any body; as he lived in a ſtate of war with, and abuſed, almoſt all his cotemporary ſcholars.

MERULA (Paul), born at Dort in Holland, a famous lawyer, hiſtorian, and linguiſt, was profeſſor of hiſtory in the univerſity of Leyden after Lipſius. He wrote, 1. Commentaries on Ennius; 2. The life of Eraſmus and Junius; 3. A coſmography; 4. A treatiſe of law; and died in 1607.

Merula, or *Blackbird,* in ornithology. See Turdus.

MERUS, (anc. geog.), a mountain of the Hither India, hanging over the city Nyſſa, built by Bacchus, and ſituated between the rivers Cophen and Indus. The name, denoting the *thigh,* gave riſe to the fable of Bacchus being inſerted into Jupiter's thigh, and being born twice; becauſe in this mountain he and his army are ſaid to have been preſerved, when diſeaſe and peſtilence raged in the place below.

MESARAIC-vessels, in the general ſenſe, are the ſame with Mesenteric.

In common uſe, meſaraic is more frequently applied to the veins, and meſenteric to the arteries, of the meſentery. See Anatomy.

MESCHED, a conſiderable town of Perſia, and in the province of Khoraſſan; fortified with ſeveral towers, and famous for the magnificent ſepulchre of Iman Riſa, of the family of Ali, to whom the Perſians pay great devotion. It is ſeated on a mountain near this town, in which are fine torquoiſe-ſtones; in E. Long. 59. 25. N. Lat. 37. 0.

MESEMBRYANTHEMUM, Fig-marigold, in botany: A genus of the pentagynia order, belonging to the icoſandria claſs of plants; and in the natural method ranking under the 13th order, *Succulentæ*, The calyx is quinquefid; the petals are numerous and linear; the capſule is fleſhy, inferior, and monoſpermous. There are between 40 and 50 ſpecies; all African plants, from the Cape of Good Hope; near 40 of which are retained in our gardens for variety. Of theſe only one is annual, and the moſt remarkable of them all. It is called the *cryſtallinum, diamond ficoides,* or *ice-plant.* It riſes with a ſhort, thick, ſucculent ſtalk, dividing low into many trailing, very ſpreading, ſucculent branches, beſpangled all over with icy pimples; very pellucid and glittering; oval, undulate, alternate, papuloſe or pimply, glittering leaves; and from the ſides of the branches, numerous, almoſt cloſe ſitting, white flowers, tinged with red or crimſon; ſucceeded by plenty of ſeed in autumn. This ſingular and curious plant, being cloſely covered with large pellucid pimples, full of moiſture ſhining brilliantly like diamonds, is in great eſteem. It is a very tender plant while young; and is raiſed annually from ſeed by means of hot-beds. In June it will endure the open air till October, when it periſhes; but if placed in a hot-houſe in autumn, it will often live all winter. It is commonly planted in pots for the conveniency of removing from place to place: but if planted in the full ground, it grows conſiderably ſtronger, even to luxuriance: however, when confined in pots, it flowers more abundantly.

The other ſpecies are moſt durable in ſtem and foliage. Some are ſhrubby; others pendulous, with looſe ſtraggling ſtems, and branches inclining to the ground; while others have no ſtalks at all; their leaves are univerſally very thick, ſucculent, fleſhy; and of many various ſhapes, ſituations; and directions while ſome are curiouſly punctured, or dotted with tranſparent points, and ſome have pellucid pimples, as already mentioned: they afford a very agreeable variety at all times in the year, and merit a place in every collection They are green-houſe plants, and are propagated by cuttings of their ſtalks and branches.

MESENTERIC, or Mesaraic an epithet given to two arteries ariſing from the deſcending aorta, and proceeding to the meſentery. See Mesentery.

MESENTERITIS, or *inflammation of he* Mesentery. See Medicine, n° 191.

MESENTERY, Mesenterium, (formed of μεσος *middle,*

middle, and εντερον *inteſtine)*, in anatomy, a fatty membranous body, thus called as being placed in the middle of the inteſtines, which it connects to one another. See ANATOMY, n° 94.

MESHES *of* NETS, the openings or interſtices between the threads.

MESN, or MESNE, a term in law, ſignifying him who is lord of a manor, and ſo hath tenants holding of him; yet he himſelf holds of a ſuperior lord.

The word is properly derived from *maiſne, quaſi minor natu;* becauſe his tenure is derived from another, from whom he holds.

MESN alſo denotes a writ, which lieth where there is lord meſn and tenant; and the tenant is diſtrained for ſervices due from the meſn to the ſuperior lord.

This is in the nature of a writ of right; and in this caſe the tenant ſhall have judgment to be acquitted or indemnified by the meſne lord; and if he makes default therein, or does not appear originally to the tenant's writ, he ſhall be forejudged of his meſnalty, and the tenant ſhall hold immediately of the lord paramount himſelf.

MESOCHRI, were muſicians among the ancients who preſided in concerts, and by beating a wooden deſk regularly with their feet, directed the meaſure of the muſic. For the purpoſe of beating time, they wore wooden clogs, called by the ancients *crupezia;* which occaſioned the ſound to be better heard.

MESOCOLON, in anatomy, that part of the meſentery, which, having reached the extremity of the ileum, contracts and changes its name. See ANATOMY, n° 94.

MESOLOGARITHMS, according to Kepler are the logarithms of the co-ſines and co-tangents; the former of which were called by Baron Napier *anti-logarithms*, and the latter *differentials*.

MESOPOTAMIA, the ancient name of the province of DIARBECK, in Turky in Aſia. It is ſituated between the rivers Euphrates and Tigris; having Aſſyria on the eaſt, Armenia on the north, Syria on the weſt, and Arabia Deſerta with Babylonia on the ſouth. The Hebrews called it *Padan-aram* (Gen. xxviii. 2. &c.), and *Aram Naharaim* (title of Pſal. lx.) or Aram *of the two rivers*, becauſe it was firſt peopled by Aram father of the Syrians, and is ſituated between the two rivers already mentioned. This country is much celebrated in ſcripture, as being the firſt dwelling of men both before and after the deluge; and becauſe it gave birth to Phaleg, Heber, Terah, Abraham, Nahor, Sarah, Rebekah, Rachel, Leah, and to the ſons of Jacob. Babylon was in the ancient Meſopotamia, till, by vaſt labour and induſtry, the two rivers of the Tigris and Euphrates were united into one channel. The plains of Shinar were in the ſame country. Often they gave it the name of Meſopotamia (Deut. xxiii. 4. &c.) and ſometimes that of Syria, (Hoſea xii. 12.) Balaam ſon of Beor was of Meſopotamia, Deut, xxiii. 4. Chuſhan-riſhathaim king of Meſopotamia kept the Hebrews in ſubjection ſome time after the death of Joſhua, Judg. iii. 8.

MESOPTERYGIUS, in ichthyology, a term applied to ſuch fiſhes as have only one back-fin, and that ſituated in the middle of the back.

MESPILUS, the MEDLAR, in botany: A genus of the pentagynia order, belonging the icoſandria claſs of plants; and in the natural method ranking under the 36th order, *pomaceæ*. The calyx is quinquefid; the petals are five; the berry is inferior and pentaſpermous. There are ſeven ſpecies, viz,

1. The Germanica, German meſpilus, or common medlar, riſes with a deformed tree-ſtem, branching irregularly 15 or 20 feet high ſpear-ſhaped leaves, downy underneath; and large cloſe ſitting, white flowers, ſingly from the ſides of the branches; ſucceeded by large roundiſh brown fruit, the ſize of middling apples, which ripen in October, but are not eatable till beginning to decay. The varieties are, common great German medlar—ſmaller Nottingham medlar—ſpear-ſhaped Italian medlar. This ſpecies and varieties are all cultivated in the Engliſh gardens for the fruit: but the German or Dutch medlar, and the Nottingham kind, are the moſt common; and the latter of which two, though a ſmaller fruit, is rather preferable for richneſs and poignancy of flavour. Theſe kinds of fruit are never eatable until they begin to rot; for when firm and ſound, they are of a ſingularly auſtere diſagreeable taſte; yet having lain ſome time after being gathered, till they begin to aſſume a ſtate of decay and became ſoft, they acquire a delicious flavour, extremely agreeable to many, though to others altogether unpalatable.—All theſe ſorts ripen in the latter end of October, or beginning of November; when being gathered, ſome ſhould be laid in moiſt bran, in ſeveral layers, to forward their decay; others on ſtraw in the fruitery: thoſe in the bran will begin to be ready for uſe in about a fortnight, and thoſe laid on ſtraw will come gradually forward in ſucceſſion.

2. The arbutifolia, arbutus-leaved meſpilus, hath a ſhrubby ſtem, branching erectly five or ſix feet high; lanceolate, crenated, alternate leaves, downy underneath; and from the ſides and ends of the branches, ſmall white flowers in cluſters; ſucceeded by ſmall, roundiſh, purple fruit, like haws.

3. The amelanchier, or ſhrubby, medlar, with black fruit, riſes with ſeveral ſhrubby, ſlender, hairy ſtems, branching moderately about four feet high, having purpliſh branches; oval, ſerrated leaves, downy underneath; and ſmall white flowers, in cluſters at the ends of the branches: ſucceeded by ſmall black fruit.

4. The chamæ-meſpilus, or dwarf medlar, commonly called *baſtard quince*, hath a ſhrubby, ſlender ſmooth ſtem, branching weakly four or five feet high having purpliſh branches; oval, ſerrated, ſmooth leaves, on long foot-ſtalks; and from the axillas, purple flowers, collected into round heads, with narrow, purpliſh, deciduous bracteæ; ſucceeded by ſmall red fruit.

5. The cotoneaſter, commonly called *dwarf quince*, riſes with a ſhrubby, ſmooth ſtem, branching four or five feet high, the branches ſlender and reddiſh; oval entire leaves on ſhort foot-ſtalks; and from the axillas, ſmall cloſe-ſitting purple flowers, two or three together ſucceeded by ſmall roundiſh, bright-red fruit.

6. The Canadenſis, Canada ſnowy meſpilus, hath a ſhrubby, ſmooth ſtem, branching four or five feet high, with ſmooth, purpliſh branches; oval-oblong, ſerrated, ſmooth leaves, on long footſtalks; and all

the branches terminated by cluſters of ſnowy-white flowers; ſucceeded by ſmall, purpliſh fruit, like haws.

7. The pyracantha, or ever-green thorn, riſes with a ſhrubby, ſpinous ſtem, branching diffuſely 12 or 14 feet high, the branches ſlender and flexible, with a dark greeniſh bark, armed with long ſharp ſpines; ſpear-ſhaped-oval, crenated, ever-green leaves: and all the ſhoots terminated by numerous cluſters of whitiſh flowers; ſucceeded by large bunches of beautiful red berries, remaining all winter, and exhibiting a very ornamental appearance.

All theſe ſeven ſpecies of meſpilus are of the tree and ſhrub kind: the firſt ſix ſorts are deciduous, the ſeventh an ever-green; the leaves are univerſally ſimple; thoſe of the meſpilus Germanica very large, the others moſtly of moderate ſize, and which in moſt of the ſorts grow upon ſhort footſtalks. They all flower abundantly every ſummer, the flowers univerſally hermaphrodite, and conſiſting each of five large roundiſh petals, 20 ſtamina, and five ſtyles. They are all very hardy, and ſucceed in any common ſoil and ſituation, and their propagation and culture is very eaſy.

The firſt ſort and varieties are cultivated as fruit-trees, principally as ſtandards, ſometimes alſo as eſpaliers for variety. The other ſpecies are very proper furniture for any ornamental plantation, where they will make an agreeable variety with their different foliage; and their flowers make a fine appearance, as alſo their fruit in autumn and winter, which, if not devoured by birds, remain long on the branches, and afford a fine variety in thoſe ſeaſons. The pyracantha, being rather of flexible growth, is moſt commonly trained againſt walls or the fronts of houſes, both for the ſupport of its flexible branches, and that it may exhibit its berries more ornamentally.

When it is deſigned to have any of the common medlars as fruit-trees, they may be trained either as dwarfs, for dwarf ſtandards, or for eſpaliers, or trained as half or full ſtandards, and managed in either of thoſe modes of training nearly as other fruit-trees, particularly the apple and pear; and are raiſed either by ſeed, by grafting, or by budding; but either of the two latter methods are the moſt certain for continuing the ſorts without variation: obſerving, after ſhortening their firſt ſhoots from the graft or bud, where it ſhall ſeem neceſſary to force out a proper ſupply of wood to form a head, to train the branches afterwards principally at full length, and let the ſtandards branch out in their own way.

MESS, in a military ſenſe, implies a number of ſoldiers, who, by laying away a certain proportion of their pay towards proviſions, meſs together: ſix or eight is generally the number of each meſs. Experience proves, that nothing contributes more to the health of a ſoldier, than a regular and well-choſen diet, and his being obliged every day to boil the pot: it corrects drunkenneſs; and in a great meaſure prevents gaming, and thereby deſertion.

MESSALINA (Valeria), a daughter of Meſſala Barbatus. She married the emperor Claudius, and diſgraced herſelf by her cruelties and incontinence. Her huſband's palace was not the only ſeat of her laſciviouſneſs, but ſhe proſtituted herſelf in the public ſtreets, and few men that were at Rome who could not boaſt of having enjoyed the favours of the impure Meſſalina. Her extravagancies at laſt irritated her huſband, who commanded her to appear and anſwer all the accuſations which were brought againſt her: upon which ſhe attempted to deſtroy herſelf; and when her courage failed, one of the tribunes who had been ſent to her diſpatched her with his ſword. It is in ſpeaking of her debaucheries and lewdneſs that Juvenal ſays,

Et laſſata virus, necdum ſatiata, receſſit.

Her name has become a common appellation to denote a woman of ſhameleſs and inordinate luſt.

MESSANA, (anc. geog.), the firſt town of Sicily on croſſing over from Italy, ſituated on the ſtrait now called the *Faro*, (Italicus). Anciently called *Zancle*, according to Diodorus Siculus, from king Zanclus; or, according to others, from the Sicilian term *Zanclon*, denoting a ſickle, alluding to the curvity of the coaſt: a name appropriated by the poets; and hence *Zanclæi*, the people, (Herodotus, Pauſanias). The other name *Meſſani* is from the *Meſſenii* of Peloponneſus, (Strabo). Thucydides aſcribes its origin to Anaxilas the Meſſenian, tyrant of Rhegium, who received all comers, calling the town after the name of his country. The Greeks always call it *Meſſene*; the Romans *Meſſena* conſtantly, to diſtinguiſh it from *Meſſene* of Peloponneſus. Now Messina, lately ruined by earthquakes.

MESSENA, or Messene, an inland town, and the capital of Meſſenia, a country of Peloponneſus; erroneouſly placed by Ptolemy on the coaſt. It was built by Epaminondas, who recalled all the Meſſenian exiles, and gave the town the name of *Meſſene*. A place vying in point of ſtrength and ſituation with Corinth, according to Strabo; and therefore Demetrius Phalerius adviſed Philip, father of Perſeus, that if he wanted to have Peloponneſus in his power, he ſhould make himſelf maſter of theſe two towns, as thus he would have the ox by both horns.

MESSENGERS, are certain officers chiefly employed under the direction of the ſecretaries of ſtate, and always in readineſs to be ſent with all kinds of diſpatches foreign and domeſtic. They alſo, by virtue of the ſecretaries warrants, take up perſons for high treaſon, or other offences againſt the ſtate. The priſoners they apprehend are uſually kept at their own houſe, for each of which they are allowed 6s. 8d. *per* day by the government: and when they are ſent abroad, they have a ſtated allowance for ther journey, viz. 30l. for going to Paris, Edinburgh, or Dublin; 25l. for going to Holland; and to other places in the ſame proportion; part of which money is advanced for the expence of their journey. Their ſtanding ſalary is 45 l. *per annum*; and their poſts if purchaſed, are eſteemed worth 300 l. The meſſengers wait 20 at a time, monthly, and are diſtributed as follows, viz. four at court, five at one ſecretary's office, five at another, two at the third for North Britain, three at the council-office, and one at the lord chamberlain's of the houſehold.

Messengers, in Scotland. See Law, Part III. p. 651, par. 16.

Messengers of the Exchequer, are four officers who attend the exchequer, in the nature of purſuivants and carry the lord treaſurer's letters, precepts, &c.

Messenger of the Preſs, a perſon who, by order-of the court, ſearches printing-houſes, bookſellers ſhops, &c. in order to diſcover the printers or publiſhers of ſeditious books, pamphlets, &c.

MESSENIA, a country in the ſouth of Peloponneſus, moſtly maritime, ſituated between Elea to the weſt, and Laconica to the eaſt. Anciently a part of Laconica under Menelaus, and called *Meſſene* by Homer; interpreted by the ſcholiaſt, *Meſſenæa Regia. Meſſinii*, the people reduced to a ſtate of ſlavery and ſubjection by the Spartans; *Meſſenius*, the epithet.

This country is famous in hiſtory, on account of the reſiſtance made by the Meſſenians againſt the Spartans, and the exploits of their hero Ariſtomenes. The firſt hoſtilities commenced about the year 652 B. C. on what occaſion is uncertain. Though the Meſſinians were inferior in the knowledge of the art of war to the Spartans: yet, by keeping for ſome time on the defenſive, they improved ſo much, that in three years time they found themſelves in a capacity of giving battle to their enemies in the open field: nor did they appear to be in any degree inferior either in courage or conduct: the war was therefore protracted, with various ſucceſs, on both ſides. At laſt, both conſulted the oracle at Delphi; and received for anſwer, "that whoever ſhould firſt dedicate 100 tripods in the temple of Jupiter at Ithome, a ſtrong-hold of the Meſſenians, ſhould be maſters of the country." The inhabitants of Meſſenia, on hearing this, having no money to make the tripods of braſs, fell to cutting them out in wood; but before this could be accompliſhed, a Spartan having got into the city by ſtratagem, dedicated 100 little tripods of clay: which threw the Meſſenians into ſuch deſpair, that they at laſt ſubmitted to the Spartans.

The new ſubjects of Sparta were treated with the utmoſt barbarity by theſe cruel tyrants; ſo that a new war commenced under Ariſtomenes, a man of unconquerable valour, and enthuſiaſtically fond of liberty. He perceived that the Argives and Arcadians, who were called the *allies* of the Lacedæmonians, adhered to them only through fear of their power; but that in reality they hated them, and wiſhed to revenge the injuries they had done them. To theſe Ariſtomenes applied; and receiving an anſwer conformable to his wiſhes, he engaged his countrymen unanimouſly to take up arms. About a year after the revolt began, and before either party had received any auxiliaries, the Spartans and Meſſenians met at a village called *Deræ*, where an obſtinate engagement enſued. Ariſtomenes was conceived to have performed more than mortal atchievements: in gratitude therefore, reſpect being alſo had to his royal deſcent, his countrymen unanimouſly ſaluted him *king;* which title he modeſtly waved, alleging, that he took up arms to ſet them free, and not to make himſelf great; he conſented however, to accept the title of *general*, with a power of doing whatſoever he thought requiſite for the ſervice of the public. Knowing well the ſuperſtition of the age in which he lived, he reſolved to intimidate the Spartans, by ſhowing them what he was ſure they would take for an ill omen. Diſguiſing himſelf therefore, he went privately to the city, where, in the night, he hung up a ſhield on the wall of the temple of Minerva, with this inſcription: *Ariſtomenes dedicates this, out of the Spoils of the Spartans, to the goddeſs.* It was eaſily perceived thas this war would be both long and bloody; the Lacedæmonians therefore ſent deputies to Delphi, to inquire of the oracle concerning its event: the anſwer they received was, *That it behoved the Spartans to ſeek a leader from Athens.* The Athenians, naturally envious of the Spartans, granted their requeſt indeed, but in ſuch a manner as manifeſted their ſpite; for they ſent them for a general Tyrtæus, a ſchoolmaſter and poet, lame of one foot, and who was ſuſpected to be a little out of his wits. But here their ſkill failed them: for this captain, notwithſtanding his deſpicable appearance, proved of great conſequence to Sparta, teaching them how to uſe good, and how to bear up under evil fortune.

In the mean time, Ariſtomenes had drawn together a mighty army, the Eleans, Argives, Sicyonians, and Arcadians, having ſent troops to his aſſiſtance; the Spartans in this, as in the former war, having no ally but Corinth. The Spartan kings, according to the cuſtom of their city, no ſooner took the field, than, notwithſtanding their inferiority in number, they offered the enemy battle, which Ariſtomenes readily accepted.—It was long, obſtinate, and bloody; but in the end the Meſſenians were victorious, and the Lacedæmonians put to flight with a great ſlaughter. It is ſcarce to be conceived how much the Spartans were ſtruck with this defeat, they grew weary of the war, diſſatiſfied with their kings, diffident of their own power, and in a word ſunk into a ſtate of general uneaſineſs and want of ſpirit. It was now that the Athenian general convinced them, that he was capable of fulfilling all the promiſes of the oracle; he encouraged them by his poems, directed them by his counſels, and recruited their broken armies with choſen men from among the Helotes. Ariſtomenes, on the other hand, acted with no leſs prudence and vigour. He thought it not enough to reſtore the reputation of the Meſſenians, if he did not alſo reſtore their wealth and power: he therefore taught them to act offenſively againſt their enemies; and, entering the territories of Sparta, he took and plundered Pharæ, a conſiderable borough in Laconia, putting all ſuch as made any reſiſtance to the ſword, carrying off at the ſame time an immenſe booty. This, however, was an injury which the Spartans could not brook with patience; they therefore ſent immediately a body of forces to overtake the Meſſenians, which accordingly they did: but Ariſtomenes routed theſe purſuers, and continued to make a mighty ſlaughter of them, till ſuch time as he was diſabled by having a ſpear thruſt in his ſide, which occaſioned his being carried out of the battle. His cure, which took up ſome time, being finiſhed, he reſolved to carry the war even to the gates of Sparta; and to that purpoſe raiſed a very great army: but, whether he found his deſign impracticable, or was really diverted by ſome dream, he gave out that Caſtor and Pollux, with their ſiſter Helena, had appeared to him, and commanded him to deſiſt. A ſhort time after this retreat, going with a ſmall party to make an incurſion, and attempting to take priſoners ſome women who were celebrating religious rites near Egila, a village in Laconia, thoſe zealous matrons fell upon him and his ſoldiers with ſuch fury, that they put them to flight, and took him priſoner: however, he ſoon afterwards made his eſcape, and rejoined his forces. In the third year of the war, the Spartans with a great force entered Meſſenia, whither Ariſtocrates king of Arcadia was come, with a great body of troops, to the aſſiſtance of his allies: Ariſtomenes therefore made no difficulty of fighting when the Spartans approached; but they entering privately into a negociation with Ariſtocrates, engaged him with bribes and promiſes to betray his confederates. When the battle began, the deceitful Arcadian repreſented to the forces under his command the mighty danger they were in, and the great difficulty there would be of retreating into their own country in caſe the battle ſhould be loſt: he then pretended that the ſacrifices were ominous; and, having terrified his Arcadians into the diſpoſition of mind fitteſt to ſerve his purpoſe, he not only drew them off from both wings, but, in his flight, forced through the Meſſenian ranks, and put them too in confuſion. Ariſtomenes and his troops, however, drew themſelves into cloſe order that they might defend themſelves the beſt they could: and indeed they had need of all their valour and ſkill; for the Lacedæmonians, who expected this event, immediately attacked and ſurrounded them on all ſides. Fortune was, on this occaſion, too powerful either for the courage or the conduct of the Meſſenians; ſo that, notwithſtanding their utmoſt efforts, moſt of their army were cut to pieces and amongſt them the chief of their nobility. Ariſtomenes, with the poor remains of his ſhattered forces, retired as well as he could; and, perceiving that it was now impoſſible to maintain the war againſt the Lacedæmonions upon equal terms, he exhorted his countrymen to fortify mount Era, and to make the beſt dipoſitions poſſible for a long defence. He likewiſe placed garriſons in Pylus and Methone on the ſea-coaſts; and to theſe three places he gathered all the inhabitants, leaving the reſt of Meſſenia to the mercy of the Spartans. They, on the other hand looked on the war as now in a manner finiſhed; for which reaſon they divided the lands among their citizens, and cauſed them to be carefully cultivated, while they beſieged Era. But Ariſtomenes quickly convinced them that the war was far from being over: he chooſe out of all the Meſſenians 300 men, with whom he ravaged all the adjacent country; carried off a prodigious booty; and, when Meſſenia could no longer ſupply the wants of his garriſon, penetrated into Laconia, and bore away corn, wine, cattle, and whatever elſe was neceſſary to the ſubſiſtence of his countrymen ſhut up in Era: ſo that at laſt the Spartans were conſtrained to iſſue a proclamation, forbidding the cultivation, not only of the Meſſenian territory in their hands, but alſo of Laconia in its vicinity; whereby they diſtreſſed themſelves more than their enemies, inducing at laſt a famine in Sparta itſelf which brought with it its uſual attendant, ſedition. Here again all things had gone wrong, if the wiſdom of the poet Tyrtæus had not ſupported the Spartan courage; nor was it without much difficulty that he influenced them to continue the blockade of Era, and to maintain a flying camp for the ſecurity of the country.

Ariſtomenes, in ſpite of all theſe precautions, committed terrible depredations with his ſmall corps of 300 men. Amongſt other places which he plundered, the city of Amyclæ was one; from whence he carried not only a great quantity of riches, but alſo many carriages laden with proviſions. The kings of Sparta lying with their troops in its neighbourhood, as ſoon as they heard of this expedition, marched after Ariſtomenes with the utmoſt diligence; and, as the Meſſenians were encumbered with their booty, came up with them before they could reach Era. In this ſituation of things, Ariſtomenes, prompted rather by deſpair than prudence, diſpoſed his troops in order of battle; and, notwithſtanding they were ſo few, made a long and vigorous reſiſtance againſt the whole Lacedæmonian army. At length, however, numbers prevailed: the greateſt part of the Meſſenians were ſlain on the ſpot: and Ariſtomenes, with about 50 of his men who ſurvived the ſlaughter, were taken priſoners; that chief having received ſo many wounds, that he was ſenſeleſs when they carried him away. The Lacedemonians expreſſed the loudeſt joy at the ſight of this illuſtrious captive; who for ſo many years, by his ſingle abilities, had enabled his exhauſted country to defend itſelf againſt the whole force of Sparta. When he was recovered of his wounds, they decreed him and all his fellow-priſoners to be thrown together into a deep cavern which was the common puniſhment of the loweſt kind of offenders. This judgment was executed with the utmoſt ſeverity, excepting that Ariſtomenes had leave to put on his armour. Three days he continued in this diſmal place, lying upon and covered over with dead bodies. The third day, he was almoſt famiſhed through want of food, and almoſt poiſoned with the ſtench of corrupted carcaſes, when he heard a fox gnawing a body near him. Upon this he uncovered his face, and perceiving the fox juſt by him, he with one hand ſeized one of its hind legs, and with the other defended his face, by catching hold of its jaw when it atempted to bite him. Following as well as he could his ſtraggling guide, the fox at laſt thruſt his head into a little hole; and Ariſtomenes then letting go his leg, he ſoon forced his way through, and opened a paſſage to the welcome rays of light, from which the noble Meſſenian had been ſo long debarred. Feeble as he was, Ariſtomenes wrought himſelf an outlet with his nails; and travelling by night with all the expedition he could, at length arrived ſafe at Era, to the great joy and amazement of his countrymen. When this news was firſt blazed abroad, the Spartans would have had it paſs for a fiction; but Ariſtomenes ſoon put the truth of it out of doubt, by falling on the poſts of the Corinthians, who, as allies of the Spartans had a conſiderable body of troops before Era. Moſt of their officers, with a multitude of private men, he ſlew; pillaged their camp; and, in ſhort did ſo much miſchief, that the Spartans, under the pretence of an approaching feſtival, agreed to a ceſſation of arms for 40 days, that they might have time to bury their dead. On this occaſion, Ariſtomenes for the ſecond time celebrated the *hecatomphonia*, or the ſacrifice appointed for thoſe who had killed 100 of the enemy with their own hands. He had performed the ſame before and after his ſecond battle; and he lived to do it a third time: which muſt appear wonderful to the reader, when he is informed, that, notwithſtanding this truce, certain Cretan archers in the ſervice of the Spartans ſeized Ariſtomenes as he was walking without the walls, and carried him away priſoner. There were nine of them in all: two of them immediately flew with the news to Sparta, and ſeven remained to guard their prize, whom they bound, and conducted to a lone cottage inhabited only by a widow and her daughter. It ſo fell out, that the young woman dreamt the night before, that ſhe ſaw a lion without claws, bound, and dragged along by wolves; and that ſhe having looſed his bonds, and given him claws, he immediately tore the wolves to peices. As ſoon as Ariſtomenes came into the cottage, and her mother, who knew him, had told her who he was, ſhe inſtantly concluded that her dream was fulfilled; and therefore plied the Cretans with drink, and, when they were aſleep, took a poinard from one of them, cut the thongs with which Ariſtomenes was, bound, and then put it into his hands. He preſently verified her viſion, by putting all his guards to death; and then carried her and her mother to Era, where, as a reward for her ſervice, he married the young woman to his ſon Gorgus, then about 18 years of age.

When Era had held out near eleven years, it fell into the hands of Sparta by an accident: the ſervant of one Empiramus, a Spartan commander, driving his maſter's cattle to drink at the river Neda, met frequently with the wife of a Meſſenian, whom he engaged in an amour. This woman gave him notice that her huſband's houſe was without the wall: ſo that he could come to it without danger, when the good man was abroad; aud ſhe likewiſe gave him intelligence when her huſband was upon duty in the garriſon. The Spartan failed not to come at the time appointed; but they had not been long in bed before the huſband returned, which put the houſe into great confuſion: the woman, however, ſecured her gallant; and then let in her huſband, whom ſhe received in appearance with great joy, inquiring again and again by what exceſs of good fortune ſhe was bleſſed with his return. The innocent Meſſenian told her, that Ariſtomenes being detained in his bed by a wound, the ſoldiers knowing that he could not walk the rounds, had a grant to retire to their houſes, to avoid the inclemency of the ſeaſon. The Spartan no ſooner heard this, than he crept ſoftly out of doors, and haſtened away to carry the news to his maſter. It ſo happened, that the kings were at this time abſent from the camp, and Empiramus had the chief command of the army. As ſoon as he received this information, he ordered his army to begin its march, though it rained exceſſively, and there was no moon light. The fellow guided them to the ford, and managed matters ſo well that they ſeized all the Meſſenian poſts: yet after all, they were affraid to engage: darkneſs, an high wind, heavy rain, together with the dread af Ariſtomenes, keeping them quiet in the places they had ſeized. As ſoon as it was light, the attack began: and Era had been quickly taken, if only the men had defended it; but the women fought with ſuch fury, and by their mingling in the fray, brought ſuch an acceſſion of numbers, as made the event doubtful. Three days and two nights this deſperate engagement laſted: at laſt, all hopes of preſerving the city being loſt, Ariſtomenes drew off his wearied troops. Early the fourth morning, he diſpoſed the women and children in the centre, the Meſſenian youth in the front and rear, the leſs able men in the main body: himſelf commanded the van; the rear-guard was brought up by Gorgus and Manticlus, the former the ſon of Ariſtomenes, the latter of Theocles, a Meſſenian of great merit, who fell with much glory in this attack, fighting valiantly in the cauſe of his country. When all things were ready, Ariſtomenes cauſed the laſt barrier to be thrown open; and, brandiſhing his ſpear, marched directly towards the Spartan troops in order to force a paſſage. Empiramus, perceiving his intent, ordered his men to open to the right and left, and fairly gave them a paſſage; ſo that Ariſtomenes marched off in triumph, as it were, to Arcadia.

The Arcadians, when they heard that Era was taken were very deſirous of ſuccouring their old confederates in this deep diſtreſs: they therefore intreated their king Ariſtocrates to lead them into Meſſenia. But he, corrupted by the Lacedæmonians, perſuaded them that it was too late; that the Meſſenians were all cut off; and that ſuch a ſtep would only expoſe them to the fury of the conquerors. When the thing appeared to be otherwiſe, and it was known that Ariſtomenes was on the frontiers of Arcadia, they went in crowds to carry him proviſions, and to teſtify their readineſs to afford him and thoſe under his command all the aſſiſtance in their power. Ariſtomenes deſired to be heard before a general aſſembly; which being accordingly convoked, he there opened one of the boldeſt and beſt-laid ſchemes recorded in hiſtory: he ſaid, that he had yet 500 undaunted ſoldiers, who at his command, would untertake any thing; that it was very probable moſt of the Spartans were employed in pillaging Era, and that therefore he determined to march and ſurpriſe Sparta; which appeared ſo ſenſible that all the aſſembly loudly commended his great capacity and unſhaken courage. Ariſtocrates, however, took care to betray him: having, by various pretences, retarded the execution of the project. The Arcadians, who began to ſuſpect him, waited for and ſurpriſed the meſſengers as they came back. They took the letters from him and read them openly in the aſſembly. The purport of them was, that they acknowledged his great kindneſs both now and in the battle; and promiſed, that the Lacedæmonians would be grateful. As ſoon as the letters were read, the Arcadians fell to ſtoning their king, frequently calling upon the Meſſenians to aſſiſt them; which, however, they did not, waiting for Ariſtomenes's orders; who, far from triumphing in this ſpectacle, ſtood ſtill, with his eyes fixed on the ground, which he wet with his tears, his ſoul pierced with ſorrow to ſee a crowned head ſo ſhamefully and ſo deſervedly put to death. The Arcadians afterwards erected a monument over him, with an inſcription to perpetuate his infamy. As for the Meſſenians under the command of Gorgus and Manticlus, they paſſed over into Sicily; where they founded the city of Meſſene, one of the moſt famous in the iſland. Ariſtomenes remained, however, in Greece; where he married all his daughters, except the youngeſt, to perſons of great rank. A prince of Rhodes, inquiring of the oracle at Delphi whom he ſhould eſpouſe, that his ſubjects might be happy under his poſterity, was directed

Meſſiah.

directed to marry the daughter of the moſt worthy of the Greeks; which anſwer was immediately underſtood to point at the virgin daughter of Ariſtomenes. Her therefore he demanded, and received; Ariſtomenes accompanying him back to his dominions, where he formed a ſcheme of uniting the Lydians and Medes againſt the Spartans, reſolving with this view to go into Media, and to the court of Sardis; but while he meditated theſe great things, death ſurpriſed him, and thereby freed Lacedæmon from the moſt formidable enemy ſhe ever had.

MESSIAH, a word ſignifying one *anointed*, or inſtalled into an office by unction. It was uſual among the Jews to anoint kings, high-prieſts, and ſometimes prophets, at the deſignation or inſtallment of them, to ſignify emblematically the mental qualifications neceſſary for diſcharging theſe offices. Saul, David, Solomon, and Joaſh, kings of Judah, received the royal unction. Aaron and his ſons received the ſacerdotal, and Eliſha the diſciple of Elijah received the prophetic unction.—The name MESSIAH, *Anointed*, or *Chriſt* (Χριϛος), was given to the kings and high-prieſts of the Jews. The patriarchs and prophets are alſo called by the name of *Meſſiahs*, or the *Lord's anointed*. See 1 Sam. xii. 3, 5. 1 Chron. xvi. 22. Pſ. cv. 15.

But this name MESSIAH was principally and by way of eminence given by the Jews to their expected great Deliverer, whoſe coming they ſtill vainly wait; and is a name the Chriſtians apply to *JESUS Chriſt*, in whom the prophecies relating to the Meſſiah were accompliſhed. The ſum of theſe prophecies is, that there ſhould be a glorious perſon named *Meſſiah*, decended from Abraham, Iſaac, and Jacob, who ſhould be born at Bethlehem, of a virgin of the family of David, then in its decline, before the Jews ceaſed to be a people, while the ſecond temple was ſtanding, and about 500 years after Ezra's time; who though appearing in mean circumſtances, ſhould be introduced by a remarkable forerunner, whoſe buſineſs it ſhould be to awaken the attention and expectation of the people. That this illuſtrious perſon called *Meſſiah* ſhould himſelf be eminent for the piety, wiſdom, and benevolence of his character, and the miraculous works he ſhould perform; yet that, notwithſtanding all this, he ſhould be rejected and put to death by the Jews; but ſhould afterwards be raiſed from the dead, and exalted to a glorious throne, on which he ſhould through all generations continue to rule, at the ſame time making interceſſion for ſinners. That great calamities ſhould for the preſent be brought on the Jews for rejecting him: whereas the kingdom of God ſhould by his means be erected among the Gentiles, and diſperſe itſelf even unto the ends of the earth; wherever it came deſtroying idolatry, and eſtabliſhing true religion and righteouſneſs. In a word, That this glorious perſon ſhould be regarded by all who believed in him as a divine teacher, an atoning ſacrifice, and a royal governor: by means of whom God would make a covenant with his people, very different from that made with Iſrael of old; in conſequence of which they ſhould be reſtored to, and eſtabliſhed in, the divine favour, and fixed in a ſtate of perpetual happineſs. See *JESUS Chriſt*, and CHRISTIANITY.

The Jews, as was already obſerved, ſtill wait for the coming of the *Meſſiah*, being infatuated with the notion of a temporal *Meſſiah*, who is to be a mighty conqueror, and to ſubdue all the world. Moſt of the modern rabbins, according to Buxtorf, believe that the *Meſſiah* is already come, but that he keeps himſelf concealed, and will not manifeſt himſelf becauſe of the ſins of the Jews. Some of the Jews, however, in order to reconcile thoſe prophecies that ſeem to contradict each other as to the character and condition of the *Meſſiah*, have had recourſe to the hypotheſis of two *Meſſiahs*, who are yet to ſucceed each other; one in a ſtate of humiliation and ſuffering; the other of glory, ſplendor, and power. The firſt, they ſay, is to proceed from the tribe of Ephraim, who is to fight againſt Gog, and to be ſlain by Annillus, Zech. xii. 10. The ſecond is to be of the tribe of Judah, and lineage of David, who is to conquer and kill Annillus, and reſtore the kingdom of Iſrael, reigning over it in the higheſt glory and felicity.

Meſſiah, Meſſina.

Jeſus Chriſt aſſerts himſelf the *Meſſiah*. In St John iv. 25 the Samaritan woman ſays to Jeſus, *I know that when* Meſſiah *comes who is called* the Chriſt, *he will tell us all things. Jeſus anſwered her, I that ſpeak to thee am he.*

There are ſeveral impoſtors, who have endeavoured to paſs for *Meſſiahs*, as Chriſt himſelf predicted. J. Lent, a Dutchman, has written a hiſtory *De Pſeudomeſſiis*, "Of falſe Meſſiahs." The firſt he mentions was one Barcochab, who appeared under the empire of Adrian. The laſt was rabbi Mordecai, who began to be talked of in 1682. A little before him, viz. in 1666, appeared Sabbethai Sebi, who was taken by the Turks, and turned Mahometan.

MESSINA, an ancient, large, handſome, and ſtrong city of Sicily, and in the Vali-di-Demona, with a citadel, ſeveral forts, a fine ſpacious harbour, and an archbiſhop's ſee. It is ſeated on the ſea-ſide, 110 miles eaſt of Palermo, 260 ſouth by eaſt of Rome, and 180 ſouth-eaſt of Naples. E. Long. 15. 50. N. Lat. 38. 10. The public buildings and the monaſteries were numerous and magnificent, and it contained about 60,000 inhabitants; the harbour is one of the ſafeſt in the Meditterranean, and extremely deep; the viceroy of Sicily reſides here ſix months in the year; and it was a place of great trade in ſilk, oil, fruit, corn, and excellent wine, eſpecially ſince it was declared a free port. This city in the beginning of the year 1783 ſuffered moſt dreadfully by the earthquakes, which ſhook great part of Calabria and Sicily to their foundations, overturned many rich and populous towns, and buried thouſands in their ruins: (ſee CALABRIA and EARTHQUAKE.)—The following account of Meſſina, as it ſtood before the above period, is extracted from Mr *Swinburne's Travels in Sicily*.

A large chain of mountains preſſes upon the ſhore, and part of the city ſtands upon elevated ground. The mountains are many of them nobly wooded; the hills before them finely chequered with groves and fields. As the town runs in a ſweep along the edge of a declivity, every building of conſequence is ſeen to advantage, while the leſs noble parts are hidden by the Palazzata. This is a regular ornamental range of lofty houſes, with 19 gates, anſwering to as many ſtreets: it follows the ſemicircular bend of the port for one mile and five poles, and would have been the handſomeſt line of buildings in Europe had the deſign been compleated ; but a conſiderable part of the extent is not finiſhed, except merely in the front wall, and that ſeems to be in a very ruinous condition. Philibert Emmanuel of Savoy, viceroy of Sicily, in 1622 began this princely work. Before it is a broad quay, decorated with ſtatues and fountains ; ſhips of any burden can moor cloſe to the parapet in great depth of water. At the weſt extremity is a ſmall fort and a gate ; the other end is cloſed by the governor's houſe and the citadel, a modern pentagonal fortreſs, built on the point where the iſthmus or *braccio di San Raneiro* iſſues from the main land. On this ſlip of low ground, which with the Palazzato forms the circular harbour of Meſſina, are placed the light-houſe *(lazaretto)*, and on the point the old caſtle of St Salvatore. The circumference of the port is four miles : it probably owes its formation to an earthquake, which opened an immenſe chaſm, and then filled it with water. Near the light-houſe is a kind of whirlpool in the ſea, ſhown as the Charybdis of the ancients.

The inner part of Meſſina is dirty, though it contains a conſiderable number of neat churches and large ſubſtantial dwellings. The cathedral is Gothic, enriched with Saracenic moſaics on the altars and ſhrines ; the front of the high altar is particularly ſplendid : Gagini has embelliſhed the pulpit and ſome tombs with excellent ſpecimens of his art.—In the treaſury of this church is preſerved the palladium of Meſſina, a letter from the Virgin Mary to its citizens (A). This is the title upon which the Meſſineſe build their pretenſions to pre-eminence over the whole iſland, nay over the whole world ; to its virtues and patronage they attribute every piece of good fortune, and to their own unworthineſs all ſiniſter events that have befallen them. The authenticity of this epiſtle has been ſeriouſly impugned, and of courſe vigorouſly defended by many Sicilian divines and diſputators.

There is another church in this city that deſerves particular notice, not ſo much on account of its architecture or ornaments, as for its being the laſt refuge of the Greek liturgy, which was once the predominant ſervice of the iſland, but gradually aboliſhed by different conquerors. It is dedicated to the Virgin Mary de Grapheo, or of the *Letter*, which denomination may perhaps have furniſhed Laſcaris with the idea of his letter. It is known at preſent by the name of *la Cattolica*. According to the Greek canons, the entrance of monaſtic churches was reciprocally forbidden to each ſex, and the cathedrals were the only places of worſhip where a daily ſacrifice was offered up by the biſhop and clergy, and where both men and women were preſent at the ſame time, but in different parts of the church. From this general admittance the building acquired the title of *Catholic* or *univerſal*.

Meſſina is all paved with lava, cut into large flags of two feet ſquare : a material which the vicinity of lavas render it eaſy to procure, and which being very hard reſiſts friction better than any other.

During a ſeries of ages, notwithſtanding the various revolutions and calamities to which it has been expoſed, this city has ſtill maintained its original ſituation ; while moſt other cities have ſhifted their ground more or leſs from the place where they were firſt founded. But its ſituation enjoys advantages which have ſtill tempted ſuch of its inhabitants as eſcaped from the ravages of war and the deſolation of earthquakes, to prefer it to every other ſpot, however delightful or ſecure. It is of very ancient origin ; and has been under many different races of monarchs ; and its name has been repeatedly changed : It has been at different times called *Zanclé*, *Mamertina*, *Meſſana*. Its firſt name *Zanclé*, which in the old language of Sicily meant " a ſickle ;" alluding, as ſome authors ſuppoſe, to the form of the port ; or, according to authors, to the

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(A) The ſtory is as follows ; After St Paul had made ſome ſtay at Meſſina (a circumſtance of his travels unnoticed by St Luke), the Meſſineſe prevailed upon him to return to Jeruſalem with an embaſſy of four perſons ſent by the city to the Virgin Mary. Their excellencies were graciouſly received by her, and brought back a letter written with her own hand in the Hebrew tongue, which St Paul tranſlated into Greek. By the irruption of the Saracens this invaluable treaſure was loſt, and utterly forgotten till the year 1467, when Conſtantine Laſcaris, a refugee Greek, found a copy of it, and turning it into Latin, made it known to the citizens, and then to all the Catholic world. Its authenticity is now ſo well eſtabliſhed at Meſſina, that Regna the hiſtorian candidly acknowledges, that whoever was to confeſs even a doubt on the ſubject in that city would be treated as an infidel.

This curious epiſtle is conceived in theſe terms : Maria Virgo Joachum filia, Dei humillima Chriſti Jeſu crucifixi Mater, ex tribu Judæ ſtirpe David, Meſſanenſibus omnibus ſalutem, et Dei patris omnipotentis benedictionem. Vos omnes fide magna legatos ac nuncios per publicum documentum ad nos miſiſſe conſtat. Filium noſtrum Dei genitum Deum et hominem eſſe fatemini, et in cœlum poſt ſuam reſurrectionem aſcendiſſe, Pauli apoſtoli electi prædicatione mediante viam veritatis agnoſcentes. Ob quod vos et ipſam civitatem benedicimus cujus perpetuam protectricem nos eſſe volumus. Anno filii noſtri XLII. Indict. I. III. Nonas Junii, luna XXVII. feria V. ex Hyeroſolymis.

Thus tranſlated :—" The Virgin Mary, daughter of Joachim, moſt humble mother of God, Jeſus Chriſt crucified, of the tribe of Juda and the family of David, health and the bleſſing of God the father Almighty to all the people of Meſſina. Out of the abundance of your faith, you have, in conſequence of a public deliberation, ſent a deputation to me ; and ſince you acknowledge that my Son is both God and man, and that he aſcended into heaven after his reſurrection, as you have learned from the preaching of St Paul the apoſtle, I give my bleſſing to you and all your city, and agree to become your protectreſs. In the 42d year of my Son, the 1ſt of the Indiction, the 3d day of June, and the 27th of the moon, at Jeruſalem."

Not to dwell upon the aſtronomical blunders in theſe dates, let it ſuffice to obſerve, that Laſcaris was not aware that Denis the Little, a Syrian monk in the 6th century, was the firſt who made uſe of the era that commences our Saviour's birth.

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the fertility of the country. Allured by the advantages of its ſituation, the Cumæans, a commercial and enterpriſing people, invaded the iſland and drove the Siculi from this ſettlement; they were in their turn overpowered by a band of Samian adventurers, who made way for a colony of citizens of Meſſene, and under theſe maſters it changed its name to *Meſſana*. Their government was of ſhort duration; for in the 29th year before Chriſt it was deſtroyed by the Mamertines, a warlike unprincipled nation inhabiting the ſouth part of Brutium. Theſe ſoldiers being received into Meſſana on their return to Italy from Syracuſe, where they had ſerved as mercenaries in the army of Agathocles, took an opportunity of maſſacring the inhabitants and uſurping their poſſeſſions. The city was now called *Mamertina*; and, in order to ſupport themſelves againſt the reſentment of the Sicilian powers, the Mamertines implored the protection of the Romans, who eager to extend their dominion beyond the limits of Italy, and jealous of the growing power of Carthage, made no ſcruple to ſuccour theſe aſſaſſins with a conſular army. This ſtep brought on the firſt Punic war. The Mamertines reaped no other fruit from the alliance but a more honourable degree of ſlavery; for ſuch was the real nature of their connection with Rome, whatever name it might be diſguiſed under.

Meſſina was, however, always diſtinguiſhed by particular attentions and favours from the ſenate, and, excepting a ſhort period during the wars of the triumvirate, appears to have taſted all the ſweets of Roman proſperity, without partaking of the bitter draughts of adverſity. Its fate, in the ruin of the empire, was ſimilar to that of the reſt of Sicily. In 829 Meſſina fell into the hands of the Saracens, but obtained very honourable terms of capitulation; for half the city was left to the Chriſtians, where they were to be governed by their own laws, and profeſs their own religion undiſturbed. In the other reſided the bey of one of the five provinces into which the Arabian conquerors had divided the iſland. Notwithſtanding this indulgence, Meſſina was the firſt to caſt off the yoke in 1037, when George Maniaces landed an army of Greeks and Normans on the ſhore of the Faro. It afterwards held out againſt the whole Muſſulman force till the feeble ſtate of a diſtracted empire ſhut out all hopes of aſſiſtance from Conſtantinople. This unfortunate city then opened its gates to the army of the caliph, and felt very ſeverely the weight of his reſentment; but it did not long groan under the yoke; for in leſs than 20 years Roger the Norman took it by ſurpriſe and delivered it from Mahometan oppreſſion. During the cruſado our Richard Cœur de Lion and Philip Auguſtus king of France wintered here in their way to paleſtine; a ſojourn marked by continual quarrels, conflagration, and bloodſhed. The Meſſeneſe were particularly tardy in entering into the national conſpiracy of 1282, but afterwards exceeded the reſt of the inſurgents in deeds of cruelty: This and the importance of their ſituation ſingled them out for the firſt objects of Charles's vengeance. He inveſted their city very cloſely, and declared ſo openly his determination to refuſe all terms whatever to the beſieged that they ſaw no hopes of ſafety but in an obſtinate defence. Their courage, perſeverance, and ſufferings were exceſſive; at length their ſtrength and reſources began to fail rapidly, and every circumſtance ſeemed to denounce their ſpeedy deſtruction, when Roger Lauria appeared off the harbour with the Arragonian fleet, forced the king to retire with precipitation acroſs the ſtraits, and in his ſight defeated and deſtroyed his naval armament. Robert, grandſon of Charles I. alſo made a fruitleſs attack; but in the diſturbed reign of Frederick III. Meſſina was delivered up to Louis king of Naples and his conſort queen Joan, who entered it in triumph. In a few years it returned to its former poſſeſſors. The year 1672 was remarkable for the revolt of the Meſſineſe.—They threw off the Spaniſh yoke, and ſwore allegiance to Louis XIV. king of France. They were for ſome time vigorouſly aſſiſted by the French; but before the Spaniards had gained the leaſt advantage to excite any hopes of recovering ſo valuable a poſſeſſion, Louis found himſelf neceſſitated from motives of political intereſt to deſert his new ſubjects, and leave them to the mercy of their old incenſed maſters. The horror of being thus abandoned, and the chaſtiſement inflicted by Spain, broke the fierce ſpirit of the Meſſineſe; they were ſtill ſtunned with the remembrance and effects of this blow, when the plague in 1743 was introduced from the Levant and ſwept away more than half the inhabitants. From this chain of calamities, the opulence, trade, and population of Meſſina, have been gradually ſinking; and unleſs very favourable circumſtances happen, will every year fall lower. The number of its inhabitants does not now exceed 30,000.

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The following particulars are added from M. Houel, who viſited this city ſince the late earthquakes, which completed its deſtruction.

On the front of the cathedral there is a ſquare, which though not regular, is far from being mean. This was not the largeſt ſquare in Meſſina before its overthrow; but it was the moſt elegant, the moſt ſplendidly adorned, and the beſt frequented. There ſtands in this ſquare an equeſtrian ſtatue of Charles II. of Spain, in bronze, which has been ſpared by the earthquake. It ſtands on a marble pedeſtal, in the middle of the ſquare. Oppoſite to this ſtatue is an elegant marble fountain, ornamented with a variety of figures repreſenting men and other animals, all of them ſpouting out water in great abundance; which uſed, in ſummer, to ſpread an agreeable and refreſhing coolneſs over the ſquare, that induced company to aſſemble here. Seven ſtreets terminated here. The cathedral forms a part of the ſquare. It is dedicated to the bleſſed Virgin; the occaſion of which has been already mentioned.

There is an anniverſary feaſt celebrated in Meſſina, which is called *the feaſt of the Letter*. A lock of the Virgin's hair, which ſhe ſent to the Meſſenians at the ſame time with the letter, is carried through the city in proceſſion in a cryſtal veſſel. She made alſo a preſent of her picture to the Meſſenian deputies. It is placed over the tabernacle. None but the canons of the cathedral are permitted to touch, or take up on their ſhoulders, the ſilver ſhrine in which the cryſtal veſſel with the virgin's hair is depoſited. Eight of thoſe canons, with mitres on their heads, bear this ſhrine in the proceſſion. The canopy ſuſpended over it is ſupported by ſix ſenators in their robes. The

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picture and the hair are ſhown to ſtrangers. This proceſſion and the other religious ceremonies of this feſtival are followed by horſe races. The ſpirits of the people being already elevated by their religious exerciſes, they engage with amazing eagerneſs in theſe and the other diverſions with which they are accompanied: a tumultuous joy reigns over the city: and the evening concludes with illuminations and fireworks. The ſhips in the harbour pay the citizens the compliment of entertaining them with a diſcharge of their guns on the occaſion.

Through a ſquare called *the Square of the Great Hoſpital*, runs a large and impetuous torrent, the *Porto delle Legni*. It is precipitated from thoſe lofty mountains which overlook this city on the ſouth ſide. The channel which it has cut out for itſelf is at times entirely full. It would, on ſuch occaſions, overflow the ſquare and other parts of the city, were it not confined by walls which have been built on both ſides to prevent ſuch accidents.—Another ſtream of a ſimilar origin, called the *Torrent of La Boccetta*, runs through another part of the city; it is alſo confined within the walls to prevent it from overflowing.

The *Square of St John of Malta* is one of the largeſt in Meſſina. In the middle of this ſquare is a fine marble fountain, ornamented with a variety of ſculptured figures and jets d'eau. Beſide the fountain there uſed to ſtand a large reſervoir for horſes to drink out of.

In the time of the annual feſtivals, there uſed to be exhibited on the waters of the reſervoir a galley, or rather a fictitious repreſentation of a galley, with galley-ſlaves, ſoldiers, officers, and a commander on board, all in arms, and the galley properly equipped as a ſhip of war. This galley was decorated with great art; and by night the maſts, and every other ſuitable part, were hung with lamps, which illumined it in a very ſplendid manner. Every thing around was ſo artificially diſpoſed, that when the fire-works were played off, the ſpectator was led to think, though he perceived only one galley, that the noiſe which he heard was produced by a naval combat; and that the other ſhips were concealed from his view by the ſmoke occaſioned by the guns and fire-works. This, when properly conducted, was a noble ſpectacle. The ſenate repaired thither from the cathedral, attended with a guard and a numerous company. In one carriage ſix ſenators, the governor of the city, and ſometimes the archbiſhop. It was exceedingly large, and drawn by ſix white horſes very richly harneſſed. Other carriages followed, with the train who attended the governor and the ſenators.

Almoſt all feſtivals owe their origin to ſome extraordinary event, or ſome ſingular ſtory either true or falſe. It is ſaid, that when the ſplendor with which the feaſt of *the aſſumption de la Bera* was celebrated at Meſſina, firſt began to attract foreigners to the city, on that occaſion ſuch crowds repaired thither as to alarm the inhabitants with the fears of a famine: But one year, when the number of ſtrangers was greater than uſual at the time of this feſtival, the magiſtrates were very much at a loſs how to ſupply them with proviſions; and at length, every other reſource failing no hopes of relief remained but from the kindneſs of the Bleſſed Virgin. Fervent prayers were addreſſed to their patroneſs: and next morning by day-break three brigantines appeared entering the harbour with full ſails. They proved to be loaded with corn. It was eagerly purchaſed: and the people of the city haſted to appeaſe their hunger. But when they came after refreſhing themſelves to pay the corn-merchants their money, neither ſhips nor merchants could be found. After their firſt emotions of ſurpriſe had ſubſided, they naturally concluded that ſuch a ſeaſonable ſupply muſt undoubtedly be a preſent from the Virgin, who, being pleaſed with the zeal of her Meſſinian votaries, and deſirous to prevent the concourſe of ſtrangers who attended the feſtival from diminiſhing, had interpoſed in this miraculous manner to ſave them from the diſtreſſes of famine. A new feſtival was celebrated in gratitude to their generous benefactreſs. Three ſmall veſſels of ſilver were made, and dedicated to the Virgin in memory of the event; and theſe are at preſent uſed as lamps in the cathedral. The ſenate likewiſe decreed, that the clergy ſhould pay annually a ſmall tax, to be laid out in conſtructing a ſmall galley to ſwim on the fountain, and in defraying the expences of the fire-works. The profits of the clergy are ſo conſiderable on the occaſion of the feſtival, that they may be ſuppoſed to pay the tax with great cheerfulneſs.

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In Meſſina, as in the other cities of Sicily, the women wrap themſelves in a large black mantle above the reſt of their dreſs. The ſtuffs are richer or plainer according to rank and circumſtances. People who are not rich enough to have fine cloaths of their own, hire them at ſo much an hour. There are women who make a livelihood by lending out their cloaths. The mantle covers the wearer from head to foot.—It reduces the old and the young, the ill-ſhaped and the handſome, pretty much to an equality in point of appearance. This muſt naturally appear very unfavourable to the influence of beauty. But yet, on proper occaſions, at church or in a public walk, the ladies of Meſſina find means to open and adjuſt the mantle ſo as to diſplay all their beauties of face and ſhape, and to attract the affections of lovers, perhaps more powerfully than if their dreſs were ſuited to diſplay their charms in a more oſtentatious manner.

Between Meſſina and the tower of Faro there ſtands a ſmall church called the *Madona of the Grotto*. It was anciently a temple of a round ſtructure, and ornamented with columns like the temple of the ſun at Rome. Modern columns now ſupply the place that was occupied by the ancient. There are large niches in the rock adjoining to the temple, which are thought to be of equal antiquity. Theſe contain no ſculptured figures; but in Pagan times they might poſſibly contain ſome.

Meſſina being ſituated between mount Ætna and the gulph of Charybdis, and being likewiſe at no great diſtance from the volcanoes of Lipari and Stromboli, muſt have been in all ages liable to ſuffer by earthquakes. Such terrible events, however appear to have been more unfrequent in ancient than in modern times, and have actually alarmed the preſentage oftener than any other. In 1693 a fourth part of the cities of Sicily was deſtroyed by an earthquake. Meſſina merely felt the ſhock: all its buildings, however, ſuffered. In the year 1742 it ſuffered another equally violent. A plague which followed in 1743 retarded the repairs neceſſary after the earthquake. In the year 1780 this city continued, for more than ſix months, to ſuffer from a new earthquake.

Were the ſtate of the elements, previous to theſe dreadful events, carefully examined, it might perhaps be found to undergo certain changes which might be conſidered as prognoſticating them.

The autumn of the year 1782 was unuſually cold and rainy. Fahrenheit's thermometer was often as low as 56 degrees. The ſucceeding winter was dry; and the mercury never fell under 25 degrees: And, what is uncommon in that ſeaſon, ſtorms were now and then obſerved to ariſe from the weſt. The pilots in the channel obſerved that the tides no longer roſe at the uſual periods, and the gulph of Charybdis raged with extraordinary fury.

On the 5th of February 1783, the air was heavy and calm; the ſky obſcured with thick clouds, and the atmoſphere ſeemingly all in a flame. About half after twelve at noon the earth began to ſhake with a dreadful noiſe. The ſhocks continually increaſed, and became at length ſo violent as to open the ground, and to overturn in two or three minutes a conſiderable part of the buildings.

A long white cloud appeared to the north-weſt; and ſoon after another, very dark, in the ſame quarter of the heavens. The latter in a moment ſpread over the whole horizon, and deluged the city with rain and hail, accompanied with dreadful claps of thunder. The inhabitants fled in the utmoſt terror to the fields and the ſhips in the harbour.

From mid-day till five in the afternoon the earthquake continued almoſt without interruption. The ſhocks then became ſomewhat leſs frequent. The cries of the dying; the ſhrieks of thoſe who were half-buried under the ruins; the wild terror with which others, who were ſtill able, attempted to make their eſcape; the deſpair of fathers, mothers, and huſbands bereft of thoſe who were deareſt to them; then formed altogether a ſcene of horror, ſuch as can but ſeldom occur in the hiſtory of the calamities of the human race. Amid that awful ſcene, inſtances of the moſt heroic courage and the moſt generous affection were diſplayed. Mothers, regardleſs of their own ſafety, ruſhed into every danger to ſnatch their children from death. Conjugal and filial affection prompted deeds not leſs deſperate and heroic. But no ſooner did the earthquake ceaſe, than the poor wretches who had eſcaped began to feel the influence of very different paſſions. When they returned to viſit the ruins, to ſeek out the ſituation of their fallen dwellings, to inquire into the fate of their families, to procure food and collect ſome remains of their former fortunes—ſuch as found their circumſtances the moſt wretched became ſuddenly animated with rage, which nothing but wild deſpair could inſpire. The diſtinction of ranks, and the order of ſociety were diſregarded, and property eagerly violated. Murder, rapine, and lawleſs robbery, reigned among the ſmoking ruins.

About one in the morning another ſhock of the earthquake was felt, which overturned moſt of the houſes that were ſtill ſtanding. Moſt of thoſe whom want, or avarice, or humanity, ſtill detained among the ruins, now ſharedthe ſame fate with their friends whom the former ſhocks had buried under them.

The ſucceeding day ſcarce alleviated the diſtreſs of this diſmal night: the few wretches who ſtill ſurvived found themſelves deſtitute of every neceſſary. At length order was in ſome degree re-eſtabliſhed; and in two days after every perſon was ſupplied at leaſt with ſome ſmall portion of the neceſſaries for ſubſiſtence.

None yet thought of returning to take up their abode among the ruins. The common people fixed their reſidence on the plain of Porta Salvo, near the town of Salleo. The nobles, magiſtrates, and merchants, took up their abode on another plain, on the other ſide of the ſtream Porta de Legno; the ſoldiers at Terra Nuova.

Some violent ſhocks which were again felt on the 7th of February and the 28th of March completed the deſtruction of the city. The corn magazines, however, eſcaped without damage; and the public ovens and the aqueducts were but little injured. From theſe facts it may perhaps be inferred, that had not the houſes of Meſſina been, in general, haſtily built at the firſt, and afterwards careleſsly repaired, fewer of them would have been overthrown by the earthquake.

The neighbouring villages having ſuffered but little, were the firſt to relieve the remaining inhabitants of Meſſina in their diſtreſs. Malteſe galleys for ſome days ſupplied neceſſaries to the poor and the ſick with a generoſity which merits the higheſt praiſe. They brought ſurgeons and whatever was needful for the cure of the wounded. The ſupplies ſent by the king of France were refuſed, for what reaſon we know not. What money was needed for the ſupport of the people was taken from the treaſury of the city of Meſſina; for what the king of Naples ſent was ſeized and ſpent by the garriſon.

It is ſaid that not more than 800 or 900 perſons periſhed by this earthquake. The ſea during that convulſion of the land was ſlightly agitated in the harbour. Farther out the ſea was more violently agitated; but none of the ſhips in the harbour were daſhed to pieces. The waters roſe ſo high as to be injurious in a very conſiderable degree to Pharo, as well as along the coaſt of Scylla and Bagnara.

This earthquake was not of a momentary duration like that by which Liſbon was deſtroyed, and like many others: for more than ſixty days, from the 5th of February to the beginning of April, Meſſina continued to be ſhaken; and in that time felt more than 200 ſhocks. And ever after that period the alarm was again and again renewed. Not only the magiſtrates, the ſoldiers, and the people, but the prieſts likewiſe, with their tabernacle and altar, retired to the barracks. The nuns, too, deſerted their cloiſter, and ſought a retreat without the walls. Some of them confined themſelves to the gardens of their convents; others mixed indiſcriminately with the people.

The chief damage which the public buildings within the city ſuffered was the fall of the dome of the church of Purgatory. Only the walls were left ſtanding: and even theſe had ſuffered conſiderably. One half of the ſteeple of the cathedral was beaten to the ground. The magazines of Porto Franco were likewiſe very much ſhattered. The fort of St Salvator, being built on an artificial foundation, the ſide next the ſea is there fallen down; but on the other ſide where it is founded on a rock, it has ſtood unmoved by all the ſhocks of the earthquake.

On the 5th of February, when the earthquake was more violent than at any time afterwards, a ſtrong ſmell of ſulphur was felt. the earth was affected ſomewhat in the ſame way as if it had been borne upon a fluid; and ſeemed to reel with the ſhocks much like a ſhip toſſed with the waves. This tremulous motion was felt all over Sicily; but towards Pharo it became weaker. On the following days the ſky was cloudy; the mountains of Sicily and the ſhores of Calabria continued covered with a thick fog like ſmoke. North and north-eaſt winds raged with the moſt violent impetuoſity.

The diſaſtrous year of this earthquake was ſcarce concluded, the chaſms which it had opened in the ground were ſtill yawning, and the poor inhabitants of the adjacent country ſtill trembled with terror, when the elements again renewed their fury to ravage this miſerable land.

On Tueſday the 6th of January 1784, about ſunriſe, the wind began to blow ſoftly from the north-eaſt. The ſea gradually ſwelled, roſe beyond its bed with rapid impetuoſity, overflowed the quay of Meſſina, and laſhed with its billows the ruins of the Palazzatta. It looſened and diſplaced many of the ſtones of the mole, ſpread over the whole ſtreet, and attacked the pedeſtals of the ſtatues which had been ſpared by the earthquake, and ſtill ſtood firm among the ruins. The ſame furious wind which ſwelled the ſea in ſo extraordinary a manner, ravaged the whole coaſt from Meſſina all the way to Syracuſe.

MESSUAGE, Messuagium, in law, a dwelling-houſe, with ſome land adjoining aſſigned for its uſe. By the name of *meſſuage* may a garden, ſhop, mill, cottage, chamber, cellar, or the like, paſs.—In Scotland, *meſſuage* denotes what is called in England the *manor houſe*, viz. the principal dwelling-houſe within any barony.

MESOPORPHYRON, a name given by the Greeks to the Roman *laticlave*; becauſe that garment being edged on each ſide, where it opened before, with purple, appeared when cloſed with two purple ſtripes down the middle. The ſame term was alſo applied to the *anguſticlave*.

META, in the Roman circus, was a pile of ſtones of a pyramidical form, intended as a boundary of the *ſtadium*, or chariot courſe.—When the meta was paſſed the ſeventh time, the race was concluded. The greateſt art and management were required in avoiding the meta, and yet going as near it as poſſible. If they went too near, they were in the greateſt danger of breaking the chariot to peices; and if they took too large a circuit in the turn, they gave their rivals an opportunity of getting within them, beſides loſing a great deal of ground. The boundary of the Grecian *ſtadium*, or courſe, was called τελος, τερμα, γραμμη and ακρα γραμμη; to which laſt name Horace probably alludes in calling death, "*ultima linea rerum*."

The *metæ* at Rome were firſt of wood, afterwards of ſtone; but the emperor Claudius made them of gold, or rather guilded them. In the Roman circus there were two *metæ*, one at the entrance of the courſe, and the other at the end of it. An egg was placed upon the top of the *metæ*.

METACARPUS, or Metacarpium, (from μετα *behind*, and καρπος, *hand*), in anatomy, that part of the hand between the wriſt and the fingers. See Anatomy, n° 55.

METAGITNION, the ſecond month of the Athenian year, anſwering to the latter part of our July and the beginning of Auguſt, and ſo called from *metagitnia* a feſtival in honour of Apollo which was kept in it. The Bœotians called this month *panemus*, and the Syracuſans, *carnius*.

METAL, in natural hiſtory, a ſimple, ponderous, ſhining, fixed, opaque body, that fuſes and becomes fluid by fire, and by cold coagulates and hardens into a ſolid maſs capable of being diſtended under the hammer. See Metallurgy, and Chemistry.

Metal, in heraldry. There are two metals uſed in heraldry, by way of colours, viz. gold and ſilver, in blazon called *or* and *argent*.

In the common painting of arms thoſe metals are repreſented by white and yellow, which are the natural colours of thoſe metals. In engraving, gold is expreſſed by dotting the coat, &c. all over; and ſilver, by leaving it quite blank.

It is a general rule in heraldry, never to place metal upon metal, nor colour upon colour: ſo that if the field be of one of the metals, the bearing muſt be of ſome colour; and if the field be of any colour, the bearing muſt be one of the metals.

Metals, Solution of. See Chemistry-*Index*.

On this ſubject Mr Keir has ſome curious obſervations in the Philiſophical Tranſactions for 1790. He takes notice, that the word *ſolution* has two meanings; one expreſſive of the act of diſſolving, as when we ſay that "ſolution is a chemical operation;" and the other, when it is put for the ſubſtance diſſolved in the acid, as a ſolution of ſilver in the nitrous acid." To avoid confuſion, therefore he uſes the word *ſolution* to expreſs the ſubſtance diſſolved, together with its ſolvent: *diſſolution* being the term made uſe of when the act of diſſolving is meant. He continues the uſe of the terms *phlogiſticated* and *dephlogiſticated* to expreſs certain ſtates of the acids, but without reference to theory of any kind.

In diſſolving metals, our author obſerves, that the properties of the ſeveral acids have been inveſtigated with conſiderable ſucceſs; and even one compound, viz. that of ſpirit of nitre and ſpirit of ſalt, commonly called *aqua regis*, is well known on account of its quality of diſſolving gold. A vaſt field, however, yet remains for examination in the other acids, whether mixed together, or poſſeſſing various degrees of concentration, temperature, or phlogiſtication. Thus, tho' no two ſubſtances are more frequently in the hands of chemiſts than vitriolic acid and nitre, yet the properties of the mixture had not been inveſtigated before Mr Keir made his experiments; and upon trial he found, that this mixture poſſeſſed certain properties which neither the vitriolic nor nitrous acids ſingly poſſeſs. The reſults of his experiments on this ſubject are as follow.

1. In a long-necked retort containing 1400 grain meaſures, 100 grains of oil of vitriol of the ſpecific gravity of 1.844 were put along with 100 grains of pure nitre, and the ſalt diſſolved in the acid by means of a water-bath. On applying a boiling heat, the ſilver began to diſſolve, and the ſolution aſſumed a purple

or violet colour; but no air was extricated. An end was put to the operation (by the ruſhing in of the water uſed in the pneumatic apparatus applied to the retort) when 39 grains of ſilver had been diſſolved.

2. To 100 grains of nitre previouſly diſſolved in an equal quantity of vitriolic acid, 200 grains of ſtandard ſilver were added; of which 92 grains were diſſolved without the production of any air or gas: but upon pouring in 200 grains of water into the retort, a violent efferveſcence took place, and 3100 meaſures of nitrous gas were thrown off; and on adding 200 grains more a farther emiſſion of 600 grain meaſures enſued; but no more was emitted on the addition of more water, nor did any farther diſſolution of the metal take place than two grains. The ſame phenomena took place in various proportions, according to the different quantities of acid and metal made uſe of.

On ſubſtituting tin for ſilver, none of the metal was diſſolved or calcined by mixtures in the proportion of 200 grain meaſures of oil of vitriol to as much nitre, nor by 200 of the vitriolic acid to 150 of nitre: but with a proportion of 200 meaſures of the acid to 100 grains of nitre, the tin ſoon began to be acted upon, and diffuſed through the liquor; but no gas was extricated till the digeſtion had been continued in boiling water for two hours. The tin was ſtill only calcined, not diſſolved; 8500 grain meaſures of nitrous gas were extricated, and 73 grains of the metal reduced to a white powder. On pouring into the retort 200 grains of freſh water, a new efferveſcence took place betwixt the water, and white powder, by which 4600 grain meaſures of nitrous gas were thrown off. The action of the menſtruum was greatly promoted by augmenting the quantity of oil of vitriol, and adding water to the mixture.

By this mixture quickſilver was calcined to a grey powder, nickel was alſo partly calcined and partly diſſolved; but no other metal was much affected, tho' the ſurfaces of ſome of them were tarniſhed. The mixtures themſelves were very apt to congeal, eſpecially where there was a large proportion of nitre; and their properties are much altered by the addition of water. Thus, in their concentrated ſtate, they do not act upon iron; but by adding water, it acquires the property of acting upon that metal, and in different degrees according to the quantity of water added. Thus, by adding two meaſures of the compound acid to one of water, the liquor is rendered capable of calcining iron, and forming with it a white powder, but without any efferveſcence. An equal meaſure of water produces efferveſcence; and with a larger proportion of water the iron acquires a yellow or brown colour, ſuch as phlogiſticated nitrous acid acquires from iron, or communicates to a ſolution of martial vitriol in water. Dilution with water renders this compound acid capable of diſſolving copper and zinc, neither of which it will touch in its concentrated ſtate.

From this property of the compound acid not diſſolving copper, but very readily ſilver, we have an eaſy method of ſeparating the two metals from each other. This might be uſeful in many caſes; but is particularly ſo in Birmingham, where great numbers of copper veſſels covered with ſilver are manufactured. Thus there are always a great number of cuttings or ſmall bits called *ſcraps*, which are of no uſe but to ſeparate the two metals from one another. The eaſieſt method of doing this is an object of ſome conſequence. Two methods have been generally practiſed for this purpoſe: one is by melting the whole maſs of metal with lead, and ſeparating them by means of eliquation and teſting; the other is by diſſolving both metals in vitriolic acid, and then ſeparating the ſolution of copper from the vitriol of ſilver. The diſadvantage of the former method is, the quantity of lead and copper waſted; and of the latter, that of vitriolic acid. The virtues of a mixture of oil of vitriol and nitre were ſome time ago communicated by Mr Keir to an artiſt at Birmingham; and it is now generally uſed there to effect the ſeparation of the two metals. The method of uſing it is very eaſy; nothing more being requiſite than to put the pieces of plated metal into a glazed earthen pan, and to pour upon them ſome of the acid liquor, which may contain about one pound of nitre to eight or ten of oil of vitriol. Stir them about, and aſſiſt the action by an heat from 100 to 200 of Fahrenheit's ſcale. When the liquor is nearly ſaturated, the ſilver may be precipitated in the form of *luna cornea* by common ſalt; or it may be obtained in its metallic form by adding to the liquor ſome pieces of copper, and as much water as will enable it to act upon them. He is of opinion, that the menſtruum may be uſeful in all ſeparations of ſilver from other metals. The name he ſeems to wiſh to impoſe upon it is *aqua regina*. The following are the concluſions drawn from the experiments on theſe mixtures by our author.

1. A mixture of the vitriolic and nitrous acids diſſolves ſilver plentifully.

2. It acts upon tin, and moſtly calcines it, as well as mercury and nickel; having little or no action upon other metals.

3. The quantity of gas produced while the metal is diſſolving, is greater, relatively to the quantity of the metal diſſolved, when the proportion of nitre to the vitriolic acid is ſmall, than when it is large; and when the metals are diſſolved by mixtures containing much nitre with a ſmall production of gas, the ſolution itſelf, or the metallic ſalt formed in it, yields abundance of gas when mixed with water.

4. Dilution with water renders the concentrated mixture leſs capable of diſſolving ſilver, but more ſo of acting upon other metals.

5. This mixture of highly concentrated vitriolic and nitrous acids, acquires a purple or violet colour when phlogiſticated, either by the addition of inflammable ſubſtances as ſulphur, or by its action on metals, or by very ſtrong impregnation of oil of vitriol with nitrous gas.

6. By means of this phlogiſtication the mixture acquired a property of diſſolving, though in ſmall quantities, copper, iron, zinc, and regulus of cobalt.

7. Water expels a vaſt quantity of nitrous gas from a concentrated mixture of vitriolic acid and nitre impregnated with it; but this fluid unites with a mixture of oil of vitriol and nitre without any conſiderable efferveſcence.

By adding to the mixture of oil of vitriol and nitre a ſolution of common ſalt, a very powerful *aqua regia* is formed, capable of diſſolving gold and platina; and which, though perfectly free from all metallic matter, acquires at once a deep yellow colour. Dry common ſalt added to the concentrated mixture produces an efferveſcence, but no yellow colour.

METALEPSIS. See ORATORY, nº 59.

METALLISATION, the natural proceſs by which metals are formed in the bowels of the earth. See METALLURGY, ſect. i.

M E T A L L U R G Y.

METALLURGY, according to Boerhaave, comprehends the whole art of working metals, from the glebe or ore to the utenſil; in which ſenſe eſſaying, ſmelting, refining, parting, ſmithery, gilding, &c. are only branches of metallurgy. But, in the preſent work, Gilding, Parting, Purifying, Refining, Smithery, &c. are treated under their proper names. With others, therefore we have choſen to reſtrain *Metallurgy* to thoſe operations required to ſeparate metals from their ores for the uſes of life. Theſe operations are of two kinds: the ſmaller, or Eſſaying; and the larger, or Smelting. But a particular deſcription of the ores themſelves ſeemed likewiſe neceſſary to be given; and to this place, too, we have referred a general account of metals, metalliſation, mines, and ores, as a proper introduction to the ſubject. Hence the following diviſion into three parts. The *firſt* treating, 1. Of metals and metalliſation. 2. Of mines and ores in general. 3. Of the pyrites. 4. Of the eſſaying of ores in general. The *ſecond*, Of the particular ores, and the methods of eſſaying them. The *third*, Of ſmelting of ores, or the methods of extracting metals from large quantities of ores for the purpoſes of commerce or manufacture.

P A R T I.

SECT. I. *Of Metals and Metalliſation.*

UNDER the general name *metal*, we comprehend here not only the metals properly ſo called, but alſo the *ſemimetals*, or all matters which have the eſſential metallic properties which we ſhall here recount. Thus the word *metal* and *metallic ſubſtance* will be ſynonymous in this article.

Metallic ſubſtances form a claſs of bodies, not very numerous, of very great importance in chemiſtry, medicine, arts, and the ordinary affairs of life. Theſe ſubſtances have very peculiar properties, by which they differ from all other bodies.

The natural bodies from which metals differ the leaſt are, earthy and pyritous matters, on account of their ſolidity and denſity. Metals and ſtones are, nevertheleſs, very different; the heavieſt ſtones which are unmetallic being much lighter than the lighteſt metals. A cubic foot of marble weighs 252 pounds; and an equal bulk of tin, the lighteſt of metals, weighs 516 pounds. The difference is much greater when the weight of ſuch ſtone is compared with that of gold, a cubic foot of which is 1326 pounds.

Opacity is another quality which metals poſſeſs eminently, the opacity of metals being much greater than that of any unmetallic ſubſtance.

This great opacity of metals is a conſequence of their denſity; and theſe two properties produce a third, peculiar alſo to metals, namely, a capacity of reflecting much more light than any other body: hence metals whoſe ſurfaces are poliſhed, form mirrors repreſenting the images of bodies more clearly than any other matter. Thus looking-glaſſes produce their reflection merely by the ſilvering, which is a covering of metal upon their ſurfaces. To this reflective property metals owe their peculiar luſtre, called the *metallic luſtre*.

Although the ſeveral metallic ſubſtances differ conſiderably in hardneſs and fuſibility, we may ſay in general, that they are leſs hard and leſs fuſible than pure earths.

Metals cannot unite with any earthy ſubſtance, not even with their own earths, when theſe are deprived of their metallic ſtate: hence, when they are melted, they naturally run into globes, as much as the abſolute gravity of their maſs, and their preſſure upon the containing veſſels, will allow. Accordingly, the ſurface of a metal in fuſion is always convex. A metal in that ſtate always endeavours to acquire a ſpherical form, which it does more perfectly as the maſs is leſs. This effect is very ſenſible in quickſilver, which is nothing but a metal habitually fluid or fuſed. A maſs of ſeveral pounds of mercury, contained in a ſhallow widemouthed veſſel, is ſo ſpread out, that its upper ſurface is almoſt flat, and the convexity is not very ſenſible but at its circumference; on the contrary, if we put very ſmall maſſes of mercury into the ſame veſſel, as, for inſtance, maſſes weighing a grain each, they become ſo round as to ſeem perfect globes. This effect is partly occaſioned by the inapitude of metals to unite with the veſſels containing them when in fuſion, by which quality the whole affinity which ſubſiſts betwixt the integrant parts of theſe metals is capable of acting; and partly alſo by this affinity, which diſpoſes the integrant parts to come as near to each other as they can, and conſequently to form a ſphere.

This property is not peculiar to melted metals, but to all fluids, when contiguous to bodies ſolid or fluid, with which they have no tendency to unite. Thus, for inſtance, maſſes of water upon oily bodies, or oily maſſes upon bodies moiſtened with water, aſſume always a form ſo much nearer to the ſpherical as they are ſmaller. Even a large drop of oil poured upon a watery liquor, ſo that it ſhall be ſurrounded with this liquor, becomes a perfect ſphere.

All metals are in general ſoluble by all acids; but often theſe ſolutions require particular treatment and circumſtances, which are mentioned under CHEMISTRY. With acids, they form a kind of neutral ſalts, which have all more or leſs cauſticity. The affinity of metals is leſs than of abſorbent earths and alkaline ſalts to acids; and therefore any metal may be ſeparated from any acid by theſe ſubſtances.

Alkaline ſalts are capable of acting upon all metallic ſubſtances, and by proper management will keep them diſſolved.

Metals may in general be united with ſulphur and liver of ſulphur. With ſulphur they form compounds reſembling the peculiar ſubſtance of ores, which are generally nothing elſe than natural combinations of ſulphur and metal. Metals have leſs affinity with ſulphur than with acids; hence ſulphur may be ſeparated from them by acids. Some exceptions from theſe general rules, concerning the affinity of metals to ſulphur and liver of ſulphur, and concerning their ſeparation from ſulphur by acids, may be ſeen under the articles of the ſeveral metals. But theſe exceptions do probably take place, only becauſe we have not yet found the method of ſurmounting ſome obſtacles which occur in the ordinary methods of treating certain metals.

All metals may in general be united with each other, with which they form different allays which have peculiar properties; but this rule alſo is not without ſome exceptions.

Metals have a ſtrong affinity with the inflammable principle, and are capable of receiving it ſuperabundantly.

Laſtly, oily ſubſtances ſeem to be capable of acting upon all metals. Some metals are eaſily and copiouſly diſſolved by oils; and perhaps they might all be found to be entirely ſoluble in oils, if the methods known in chemiſtry were tried for the accompliſhment of theſe ſolutions.

The properties abovementioned agree in general to all metallic ſubſtances: but, beſides the properties peculiar to each metal, ſome properties are common to a certain number of them; and hence they have been divided into ſeveral claſſes.

Theſe metallic matters which, when ſtruck by a hammer, or ſtrongly compreſſed, are extended, lengthened, and flattened, without being broken (which property is called *ductility* or *malleability)*, and which alſo remain fixed in the moſt violent and long continued fire, without diminution of weight, or other ſenſible alteration, are called *perfect metals*. Theſe perfect metals are three; *gold, ſilver, platina*.

The metallic matters which are ductile and fixed in the fire to a certain degree, but which are deſtroyed by the continued action of fire, that is, changed into an earth deprived of all the characteriſtic properties of metals, are called *imperfect metals*. Of this kind are four; *copper, iron, tin, lead*.

The metallic ſubſtances which, as well as the imperfect metals, loſe their metallic properties by expoſure to fire, but which alſo have no ductility or fixity, are diſtinguiſhed from the others by the name of *ſemi-metals*. Of this claſs are ſeven; *regulus of antimony, biſmuth, zinc, nickel, regulus of cobalt, regulus of arſenic*, and of *mangeneſe*.

Laſtly, *mercury*, which has all the general properties of metals, makes a claſs ſeparate from the others; becauſe in purity and gravity it is ſimilar to the perfect metals, and in volatility to the ſemi metals. Its fuſibility alſo ſo far ſurpaſſes that of any other metallic matter, that it is not ſufficient to diſtinguiſh it from all, and to give it a diſtinct claſs. We have enumerated, therefore, in all, 15 metallic ſubſtances; four of which were unknown to the ancients, namely, platina, regulus of cobalt, of mangeneſe, and nickel.

As chemiſts can compound bodies by being capable of ſeparating the principles of ſuch bodies, and even of reuniting their principles ſo as to reproduce ſuch compounds as they were originally; and as hitherto they have not been able to accompliſh any ſuch decompoſition upon the perfect metals: hence, if all the other metallic ſubſtances were equally unalterable, we ſhould be very far from having certain notions concerning metals in general: but if we except gold, ſilver, and platina, all the other metallic matters are ſuſceptible of decompoſition and of recompoſition, at leaſt to a certain degree; and experiments of this kind have thrown much light on the ſubject.

We may obſerve, that even if we had not been able to decompoſe any metallic ſubſtance, we might ſtill, by reflecting on the eſſential properties of metals, diſcover ſufficiently well the nature of their principles.

The ſolidity, the conſiſtence, and eſpecially the gravity, which they poſſeſs in a degree ſo ſuperior to all other bodies, would not have allowed us to doubt that the earthy element, of which theſe are the characteriſtical properties, enters largely into their compoſition, and makes their baſis.

The facility with which they combine with almoſt all inflammable matters, and with all thoſe which have great affinity with phlogiſton, ſuch as acids; joined to their incapacity of being allayed with meagre matters that are purely earthy or purely watery, which have no diſpoſition to unite with phlogiſton; would alſo have furniſhed very ſtrong motives to believe, that the inflammable principle enters largely into the compoſition of metals.

The deſtructible metals preſent exactly the ſame phenomena as all other bodies containing the inflammable principle do, in the ſtate of combuſtion. When expoſed to fire, without acceſs of air, that is, in cloſe veſſels, they become red-hot, melt, or ſublime, according to their nature: but they receive no alteration in their compoſition from fire applied in this manner, and they are afterwards found to be exactly in the ſame ſtate as before. In this reſpect, they reſemble perfectly all bodies which contain no other inflammable matter than pure phlogiſton.

But when imperfect metals are expoſed to fire, with acceſs of air, as, for inſtance, under a muffle in a furnace which is made very hot, then they burn more or leſs ſenſibly, as their inflammable principle is more or leſs abundant, or more or leſs combined. Some of them, as iron and zinc, burn with a very lively and brilliant flame; but this flame is of the ſame nature as that of charcoal, of ſulphur, of all bodies, the combuſtible principle of which is pure phlogiſton, and is not in an oily ſtate, that is, furniſhes no ſoot capable of blackening.

The imperfect metals detonate with nitre, and their phlogiſton is conſumed by this method much more quickly and completely than by ordinary calcination or combuſtion. Their flame is alſo much more lively and brilliant: and ſome of them, as iron and zinc, are uſed in compoſitions for fireworks from their very vivid and beautiful flame.

Nitre is alkaliſed by theſe metallic detonations exactly in the ſame manner as in its detonation by coals.

Laſtly, imperfect metals being treated with acids which have an affinity with phlogiſton, that is, with the vitriolic and nitrious acids, and deprived by theſe acids of a more or leſs conſiderable part of their inflammable principle; they give a ſulphureous quality to vitriolic acid, and are even capable of producing ſulphur with that acid.

Although the experiments now mentioned were the only proofs of the exiſtence of an inflammable principle in metallic ſubſtances, they would be ſufficient to eſtabliſh it inconteſtably. But we ſhall ſee, when we continue to examine the phenomena attending the decompoſition of metals, that thoſe are not the only proofs.

If the inflammable matter which ſhows itſelf ſo evidently in the burning of metals, is really one of their conſtituent parts, their eſſential properties muſt be altered in proportion to the quantity of it taken from them: and this evidently happens upon trial: for the reſiduum of metallic matters, after calcination, departs from the metallic character, and approaches to the nature of mere earth. The opacity, brilliancy, ductility, gravity, fuſibility, volatility, in a word, all the properties by which metallic ſubſtances differ from ſimple earths, diminiſh or entirely diſappear, by taking from them their inflammable principle; ſo that when their calcination has been carried as far as is poſſible, they reſemble mere earths, and have no longer any thing in common with metals. Theſe earths can no longer be combined with acids or with metals, but are capable of uniting with pure earths. They are then called *calxes* or *metallic earths*. See CHEMISTRY.

We muſt obſerve concerning the decompoſition of metals, 1. That when a ſmall quantity of inflammable principle is taken from metal, only a ſmall quantity of calx is formed, and the remaining part continues in the metallic ſtate: hence, as the portion of calcined matter can no longer remain united with that which is deſtroyed, it ſeparates in form of ſcales from the ſurface of the metal when the calcination has been performed without fuſion, as generally happens to iron and to copper: or theſe ſcales float upon the ſurface of the melted matter when the calcination is performed during fuſion, becauſe the calx is ſpecifically lighter than the metal; as happens to the very fuſible metals, as tin, lead, and moſt of the ſemimetals.

2. The imperfect metals are not all equally eaſily and completely calcinable. In general, as much of their phlogiſton may be eaſily taken from them, as is ſufficient to deprive them of their metallic properties; but the remaining portion of their phlogiſton cannot be ſo eaſily driven off. Some of them, as copper, reſiſt the firſt calcination more than the reſt; and others, as lead and biſmuth, may be very eaſily calcined, but only to a certain degree, and retain always obſtinately the laſt portions of their inflammable principle; laſtly others, as tin and regulus of antimony, may not only be eaſily and quickly calcined, but alſo much more completely. All the other metals partake more or leſs of the properties relating to their calcination. In general, if we except the labours of alchemiſts, which are not much to be depended upon, we have not yet made all the proper efforts to arrive at a perfect calcination of the ſeveral metallic ſubſtances; which however is abſolutely neceſſary, before we can arrive at a complete knowledge of the nature of their earths, as we ſhall afterwards ſee.

When metallic earths have loſt but little of their phlogiſton, and are expoſed to ſtrong fire, they melt, and are reduced to compact maſſes, ſtill heavy and opake; although much leſs ſo than the metals, and always brittle and abſolutely unmalleable. If the calcination has been more perfect, the metallic earths are ſtill fuſible by fire, but leſs eaſily, and covertible into brittle and tranſparent maſſes poſſeſſed of all the properties of glaſs, and are accordingly called *metallic glaſſes*. Theſe glaſſes do not poſſeſs any of the properties of their metals, excepting that they are ſpecifically heavier than other glaſſes, that they are capable of being attacked by acids, and that the glaſſes of the ſemimetals are ſomewhat leſs fixed than unmetallic glaſſes. Laſtly, when the calcination of metals has been carried to its greateſt height, their earths are abſolutely fixed, and unfuſible in the fire of our furnaces, and poſſeſs no longer the ſolubility in acids by which metals are characteriſed.

Theſe are the principal changes which metals ſuffer by loſing their phlogiſton. They are thus changed into ſubſtances which have no properties but thoſe of earth. This is a certain proof that the inflammable principle is one of their conſtituent parts. But we have alſo other proofs of this important truth. The reduction of metallic calxes into metal, by the addition of phlogiſton alone, completes the proof; and the whole forms one of the cleareſt and moſt ſatisfactory demonſtrations in all the ſciences. This reduction is effected in the following manner:

If the earth of a metal be mixed with any inflammable matter, which either is or can be changed into the ſtate of coal, together with ſome ſalt capable of facilitating fuſion, but which, from its quantity or quality, is incapable of receiving the inflammable principle; and if the whole be put into a crucible, and the fuſion promoted by a fire gradually raiſed; than an efferveſcence will happen, accompanied with a hiſſing noiſe, which continues a certain time, during which the fire is not to be increaſed; afterwards, when the whole has been well fuſed, and the crucible taken from the fire and cooled, we ſhall find at the bottom, upon breaking it, the metal, the earth of which was employed for the operation, poſſeſſed of all the properties which it had before calcination and reduction.

We cannot doubt that this transformation of an earthy ſubſtance into a metal, is ſolely cauſed by the phlogiſton paſſing from the inflammable matter to the metallic earth. For, firſt, in whatever manner and with whatever ſubſtance metallic earths be treated, they cannot be ever reduced into metals without a concurrence of ſome ſubſtance containing phlogiſton. 2dly, The nature of the ſubſtance which is to furniſh phlogiſton is quite indifferent, becauſe this principle is the ſame in all bodies containing it. 3dly, If, after the

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the operation, the ſubſtance furniſhing the phlogiſton be examined, we ſhall find that it has loſt as much of that principle as the metallic earth has received. See Phlogiston.

The facts related concerning the decompoſition and the recompoſition of metals, prove inconteſtably that they are all compoſed of earth and phlogiſton. But we do not yet certainly know whether theſe two be the only principles of metals. We might affirm this, if we could produce metals by combining phlogiſton with ſome matter which is certainly known to be ſimple earth. But this hitherto has not been accompliſhed; for if we try to treat any earth, which has never been metallic, with inflammable matters, we ſhall perceive that the ſimple earths are not combinable with phlogiſton ſo as to form metals. We ſhall even perceive that the metallic earths reſiſt this combination, and are incapable of reduction into metal, when they have been ſo much calcined as very nearly to approximate the nature of ſimple earths.

Theſe conſiderations, added to this, that we cannot eaſily conceive how, from only two certain principles, ſo many very different compounds as the ſeveral metallic ſubſtances are, ſhould reſult, are capable of inducing a belief that ſome other principle is added to theſe two already mentioned in the compoſition of metals.

Many great chemiſts, and particularly Becher and Stahl, ſeem to be of this opinion. Chiefly from the experiments concerning the mercurification of metals, they believe that this third principle exiſts copiouſly in mercury; that it is of a mercurial nature; that it alſo exiſts in marine acid, to which it gives its ſpecific character; that, by extracting this mercurial principle from marine acid, or any other body containing it copiouſly, and by combining it with ſimple earths, theſe may acquire a metallic character, and be rendered capable of receiving phlogiſton, and of being completely metalliſed.

Theſe chemiſts admit alſo, and with probability, a different proportion of metallic principles in the ſeveral metals; and believe, that particularly the principle which they call *mercurial earth*, exiſts more copiouſly and ſenſibly in certain metals than in others. The moſt mercurial metals, according to them, are mercury, ſilver, lead, and arſenic. Moſt chemiſts diſtinguiſh them from the other metals, which they call *white metals*, *lunar metals*, or *mercurial metals*.

All theſe conſiderations being united, and others too many to be mentioned, give ſome probability to the exiſtence of the mercurial principle in metals. We muſt however acknowledge, that the exiſtence of this principle is merely probable; and, as Stahl obſerves, is not nearly ſo well demonſtrated as that of the inflammable principle: we may even add, that we have ſtrong motives to doubt of its exiſtence.

To produce metals artificially has juſtly been reckoned one of the moſt difficult problems in chemiſtry.

Metallic ſubſtances, although they reſemble each other by their general properties, differ nevertheleſs from each other very evidently by the properties peculiar to each. Do theſe differences proceed from the different proportion, and from the more or leſs intimate connection of the inflammable principle with the earthy principle, ſuppoſing that this latter ſhould be eſſentially the ſame in all metals? or ought they to be attributed to the difference of earths, which in that caſe would be diſtinct and peculiar to each metal? or, laſtly, do metals differ from each other, both by the nature of their earths, and by the proportion and intimacy of connection of their principles? All theſe things are entirely unknown; and we may eaſily perceive, that till they are known, we cannot diſcover what method to purſue in our attempts to accompliſh the combinations we are now treating of.

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The moſt eſſential point then is, to arrive at a knowledge of the true nature of the earths which are in metals; and the only method of arriving at this knowledge is, by reducing them to their greateſt ſimplicity by a perfect calcination. But this cannot be accompliſhed but by long and difficult operations. We have ſeen above, that all metals are not calcinable with equal eaſe; that the perfect metals have not been hitherto calcined truly by any proceſs; and that, in general, the laſt portions of phlogiſton adhere very ſtrongly to calcinable-metals.

Some metals, however, as tin and regulus of antimony, may be eaſily calcined ſo as to be rendered irreducible. By carrying the calcination ſtill further, we might obtain their earths ſo pure, that all their eſſential properties may be diſcovered, by which they might be eaſily compared together. This compariſon would decide whether their nature be eſſentially different or not.

If they were found to be compoſed of earths eſſentially the ſame, we might next proceed to compare metallic with unmetallic earths. If the former were found ſimilar to ſome of the latter kind, we ſhould be then aſſured that the earth of metals is not peculiar to them, and that ordinary unmetallic earths are ſuſceptible of metalliſation. From ſome late experiments, it was imagined that lime and magneſia alba were capable of being converted into metallic ſubſtances, but the proceſſes are now found to be erroneous.

The greater the number of metals operated upon, the more general and certain the conſequences reſulting from theſe would be: ſo that, for inſtance, if the operation were extended to all calcinable metals; and if the reſult of each of theſe operations were, that the calxes, when perfectly dephlogiſticated, do not differ from each other, and are ſimilar to earths already known; we might conclude from analogy, and we ſhould be almoſt certain, that the earths of the perfect metals are alſo of the ſame nature.

They who know the extent and difficulties of chemical operations, will eaſily perceive that this would be one of the moſt conſiderable. Nevertheleſs, after having determined this eſſential point, we ſhould only have done half our work: For a knowledge of the nature of the earth of metals, and where it is to be found, would not be ſufficient; we muſt further endeavour to find a method of combining with this earth a ſufficient quantity of phlogiſton, and in a manner ſufficiently intimate, that a metal might be formed by ſuch a combination. But this ſecond difficulty is perhaps greater than the former.

We muſt obſerve here, that ſome famous chemical proceſſes have been conſidered by many as metalliſations, but which are really not ſo. Such is Becher's famous experiment of the *minera arenaria perpetua*, by which that chemiſt propoſed to the States-General to extract gold from any kind of ſand. Such alſo is the proceſs of Becher and of Geoffroy, to obtain iron from all clays by treating them with linſeed oil in cloſe veſſels. In theſe, and many other ſuch proceſſes, we only obtain metal that was already formed. Every earth and ſand, as the intelligent and judicious Cramer obſerves, contains ſome particles of gold. Clays do not commonly contain iron ready formed; but all of them contain a ferruginous earth, naturally diſpoſed to metalliſation. (See Clay.) Accordingly we muſt conclude, that, by Mr Geoffroy's experiment, iron is only reduced or revived, but is not produced.

The great difficulties which occur in attempting to give a metallic quality to ſimple earths have induced a belief, that the nature of metals ready formed might be more eaſily changed, and the leſs perfect brought to a more perfect ſtate. To effect this, which is one of the principal objects of alchemy, and is called *tranſmutation*, numberleſs trials have been made. As we have not any certain knowledge of what occaſions the ſpecific differences of metallic ſubſtances, we cannot decide whether tranſmutation be poſſible or not. In fact, if each metallic ſubſtance have its peculiar earth, eſſentially different from the earths of the others, and conſequently if the differences of metals proceed from the differences of their earths; then, as we cannot change the eſſential properties of any ſimple ſubſtance, tranſmutation of metals muſt be impoſſible. But if the earths and other principles of metals be eſſentially the ſame, if they be combined in different proportions only, and more or leſs ſtrictly united, and if this be the only cauſe of the ſpecific difference of metals; we then ſee no impoſſibility in their tranſmutation.

Whatever be the cauſe of the differences of metals, their tranſmutation ſeems to be no leſs difficult than the production of a new metallic ſubſtance; and perhaps it is even more difficult. Alchemiſts believe that tranſmutation is poſſible, and they even affirm that they have effected it. They begin by ſuppoſing that all metals are compoſed of the ſame principles; and that the imperfect metals do not differ from gold and ſilver, but becauſe their principles are not ſo well combined, or becauſe they contain heterogeneous matters. We have then only theſe two faults to remedy, which, as they ſay, may be done by a proper coction, and by ſeparating the pure from the impure. As we have but very vague and ſuperficial notions concerning the cauſes of the differences of metals, we confeſs that we cannot make any reaſonable conjecture upon this matter; and we ſhall only adviſe thoſe who would proceed upon good principles, to determine previouſly, if metals have each a peculiar earth, or only one common to them all. In the ſecond place, if it ſhould be demonſtrated that the earthy principle is the ſame in all metals, and if that be demonſtrated as clearly as the identity of the inflammable principle in metals is proved; they muſt then determine whether theſe two be the only principles in metals, whether the mercurial principle exiſts, and whether it be eſſential to all metals or to ſome only, and what is the proportion of thoſe two or three principles in the ſeveral metallic ſubſtances. When we ſhall clearly underſtand theſe principal objects, we may then be able to determine concerning the poſſibility of tranſmutation; and if the poſſibility ſhould be affirmed, we ſhall then begin to diſcover the road which we ought to purſue.

We have no reaſon to believe that any other principle enters into the compoſition of metals than thoſe abovementioned: no veſtige is perceptible of either air or water. Some chemiſts have nevertheleſs advanced that they contain a ſaline principle. If that were true, they would alſo contain a watery principle. But all the experiments adduced to prove this opinion are either falſe, or only ſhow the preſence of ſome ſaline particles extraneous to the metals, or contained unknown to the chemiſts in the ſubſtances employed in the experiments. For metals perfectly pure, ſubjected to all trials with ſubſtances which do not contain and which cannot produce any thing ſaline, do not diſcover any ſaline property. We muſt however except arſenic, and even its regulus, theſe being ſingular ſubſtances, in which the ſaline are as ſenſible as the metallic properties.

Arſenic ſeems to be one of thoſe intermediate ſubſtances which nature has placed in almoſt all its productions betwixt two different kinds, and which partake of the properties of each kind. Arſenic thus placed betwixt metallic and ſaline ſubſtances has properties common to both theſe kinds of ſubſtances, without being either entirely a metal or ſalt. See Arsenic.

As water ſeems to act to a certain degree upon iron, even without the concurrence of air, as the operation of *martial ethiops* ſhows, we might thence ſuſpect ſomething ſaline in that metal. Nevertheleſs, what happens in that operation has not been ſo well explained, that any certain conſequences can be deduced. 1. The water employed ought to be perfectly pure; that is, diſtilled rain-water. 2. The iron employed ought alſo to be perfectly pure, and ſuch is very difficultly to be procured. 3. The operation ought to be performed in a bottle accurately cloſed, that we may be aſſured that the air contributes nothing to the action upon the iron. 4. After the water has remained a long time, ſuppoſe a year, upon the iron, it ought to be carefully filtrated and examined, to aſcertain whether it really has diſſolved any part of the metal.

In the mean time, we may conclude that metals do not ſeem to contain any ſaline principle. And when we conſider well their general properties, they ſeem to be nothing elſe than earths combined more or leſs intimately with a large quantity of phlogiſton. Although we can demonſtrate that their inflammable principle is not in an oily ſtate, and that it is pure phlogiſton, they have nevertheleſs an oily appearance, in this circumſtance, that they adhere no more than oils to earthy and aqueous ſubſtances and that they always aſſume a globular figure when ſupported by theſe ſubſtances entirely free from phlogiſton.

This reſemblance is ſo ſenſible, that chemiſts, before they knew the nature of phlogiſton, believed that metals contained an oily and fat matter. The cauſe of this quality of metals is the quantity of phlogiſton which they contain. Sulphur, phoſphorus, oils, and even fats, have this appearance merely from the inflammable principle which enters into their compoſition: for this property is communicated by that principle to every compound which contains a certain quantity of it. See Phlogiston.

When the phlogiſton combines copiouſly and intimately with earthy matters ſo as to form metals, it probably

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probably ſo diſpoſes them, that the primitive integrant parts of the new compound, that is, of the metal, approximate and touch each other much more than the integrant parts of ſimple earths can. This is proved by the great denſity or ſpecific gravity, and other general properties, of metals.

In fact, as we cannot conceive that a body ſhould be tranſparent, unleſs it have pores and interſtices through which rays of light can paſs; therefore the more denſe a body is, that is, the fewer ſuch interſtices it has, the leſs tranſparent it will be; ſo that the denſeſt bodies ought to be the moſt opaque as in metals. The diſpoſition of the pores of bodies contributes alſo much to their greater or leſs tranſparency; and bodies, the pores of which are continued and ſtraight, are more tranſparent than thoſe whoſe pores are interrupted, tranſverſe, or oblique; ſo that a body may be much more tranſparent than another which is leſs denſe, as we ſee that glaſs is more tranſparent than charcoal. But when other circumſtances are equal, the denſeſt bodies are the moſt opaque. Therefore the opacity of bodies is proportionable to their denſity, and to the deviation of their pores from right and parallel lines.

From the great opacity of metals, they probably poſſeſs both theſe qualities in an eminent degree. We have ſeen, at the beginning of this article, that the luſtre of metals, and their property of reflecting light much better than any other ſubſtance, are neceſſary conſequences of their opacity. This is alſo ſelf-evident, becauſe the fewer rays any body can tranſmit, the more it muſt reflect.

Laſtly, the ductility of metals proceeds alſo from their denſity, from the diſpoſition of their pores, and from the action of latent heat; for even the moſt brittle bodies, ſuch as glaſs, ſealing-wax, &c. become ductile by heat. The ſoftneſs, fuſibility, and volatility, of which all metals partake more or leſs, and which many of them poſſeſs in a ſuperior degree, being properties entirely contrary to thoſe of the earthy principle, probably proceed from the inflammable principle.

The order in which metals compared with each other poſſeſs moſt eminently their principal properties, is the ſame as that in which they are here enumerated, beginning always with that metal in which the property is moſt conſiderable.

1. *Specific gravity* or *denſity*. Platina, gold, mercury, lead, ſilver, copper, iron, and tin.

2. *Opacity*. We cannot well compare metals with each other in this reſpect, becauſe it is ſo conſiderable in all, that it ſeems complete. If, however, they differ in this reſpect, the ſame order will ſerve for opacity as for denſity.

3. *Metallic luſtre* or *brilliancy*. The ſame obſervation which was made concerning the laſt mentioned property is applicable to this alſo. We muſt, however, obſerve, that as by poliſh bodies are rendered brighter, and that as whiteneſs contributes much to the reflection of light, the whiteſt and hardeſt metals therefore reflect beſt. Hence according to Mr Macquer, platina ought to be placed firſt; and then iron, or rather ſteel, ſilver, gold, copper, tin, lead.

Hardneſs of metals may contribute much to the duration of their poliſh; but certainly ſoft metals, if their texture be equally compact, are no leſs capable of receiving a poliſh than hard metals. Some hard metallic allays have been found to be leſs liable to tarniſh than ſofter compounds, and have for this reaſon alſo been chiefly uſed for ſpeculums. The property of reflecting light ſeems chiefly to depend on the cloſeneſs of the particles or on the denſity, on the ſmoothneſs of the ſurface, and on the colour being moſt ſimilar to the colour of the light to be reflected. The white metals, ſilver, mercury, tin, reflect light more abundantly than others. Gold, being the denſeſt metal next to platina, and perhaps becauſe the colour of ſolar light has a ſlightly yellowiſh tinge, does alſo reflect light very copiouſly. Hence ſpeculums made of leaf-gold have been found to be very powerful. Iron or ſteel reflects much leſs light than any of the abovementioned metals, although Mr Macquer has conſidered it as capable of a greater reflective power. Platina is generally in ſo ſmall grains, that its reflective power cannot eaſily be determined. The preciſe degrees of that power which ought to be aſſigned to each of the abovementioned metals, cannot without accurate experiments be aſcertained. Perhaps, however, their reflective powers will be found to be more nearly in the following order, than in that abovementioned from Mr Macquer. Silver, quickſilver, tin, gold, copper, iron, lead.

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4. *Ductility*. Gold, ſilver, copper, iron, tin, lead. The ductility of mercury and that of platina are not yet determined.

5. *Hardneſs*. Iron, platina, copper, ſilver, gold, tin, and lead.

6. *Tenacity*. By tenacity we underſtand the force with which the integrant parts of metals reſiſt their ſeparation. This force appears to be in a compound ratio of their ductility and hardneſs. The comparative tenacity of metals is meaſured by the weight which wires of the ſame diameter, made of the ſeveral metals, can ſuſtain without breaking. Gold is the moſt tenacious; then iron, copper, ſilver, tin, lead. The tenacity of mercury is unknown; that of platina is not yet determined, but is probably conſiderable.

7. *Fuſibility*. Mercury, tin, lead, ſilver, gold, copper, iron, and laſtly platina, which cannot be fuſed by the greateſt fire of our furnaces, but only by the ſolar focus, or by a fire excited by dephlogiſticated air.

SECT. II. *Of Mines and Ores in general.*

THE ſubſtances found naturally combined with metals in the earth, are, particularly ſulphur and arſenic, ſometimes ſeparately, but generally conjointly. Metals combined with theſe ſubſtances are called *metals mineraliſed by ſulphur*, or *by arſenic*, or *by ſulphur and arſenic*; and theſe matters are called *mineraliſing* ſubſtances.

Beſides the ſulphur and arſenic with which metals are ſtrictly combined in the mineral ſtate, they are alſo pretty intimately combined with earthy ſubſtances, of different natures, and more or leſs divided.

Theſe different matters united together form maſſes which are compact, heavy, brittle, and frequently poſſeſſed of much metallic luſtre. Theſe ſubſtances are properly called *ores*, or the matter of mines.

Theſe ores are found in earths and ſtones of different kinds, as ſands, flints, cryſtals, ſlates, indurated clays, according to the ground in which they are contained. But two kinds of ſtones in particular ſeem to accompany ores; and have therefore been conſidered by ſeveral mineralogiſts as matrixes in which metals are formed. One of theſe ſtones is a kind of cryſtal, generally white, milky, and ſemi-opaque, ſtriking fire with ſteel, and of the claſs of vitrifiable earths. It is called QUARTZ.

The other ſtone is leſs hard, which does not ſtrike fire with ſteel, and is ſometimes milky like quartz; ſometimes tranſparent and of different colours; conſiſting of rhomboidal cryſtals, which are compoſed of plates and faces. This ſtone becomes more ſoft and friable by being expoſed to fire. It is called *ſpar*. Spar is more like to gypſeous ſtones than to any other, but it differs from gypſeous ſtones in poſſeſſing a much greater denſity. Some ſpars are ſo heavy, that they exceed in this reſpect all other ſtones. See SPAR.

Theſe earthy and ſtony ſubſtances form the *matrix of the ore*.

Ores are natural compounds, containing metals allayed with different ſubſtances.

Excepting gold, and a very ſmall quantity of each of the other metals found in ſome places ſo pure as to poſſeſs all their characteriſtic properties, nature exhibits to us metals and ſemimetals differently allayed not only with each other, but alſo with ſeveral heterogeneous ſubſtances, which ſo alter and diſguiſe their qualities, that in this ſtate they cannot ſerve for any of the purpoſes for which they are proper when they are ſufficiently pure.

Ores conſiſt, 1. Of metallic ſubſtances *calcined*; or, 2. Of theſe ſubſtances combined with other matters, with which they are ſaid to be *mineraliſed*.

Calcined metallic ſubſtances, or *calciform ores*, are metallic ſubſtances deprived of phlogiſton, and in the ſtate of a calx or metallic earth. Such are all *ferruginous ochres*, which are calces of iron.

Mineraliſed ores, are, 1. *Simple*, containing only one metallic ſubſtance; or, 2. *Compound*, containing two or more metallic ſubſtances.

Of the ſimple, and alſo of the compound ores, four kinds may be diſtinguiſhed.

1. Ores conſiſting of metallic ſubſtances mineraliſed by *ſulphur*. Such is the lead-ore called *galena*, compoſed of lead and ſulphur.

2. Ores conſiſting of metallic ſubſtances mineraliſed by *arſenic*. Such is the *white pyrites*, containing iron and arſenic.

3. Ores conſiſting of metallic ſubſtances mineraliſed *by ſulphur and by arſenic*. Such is the *red ſilver-ore*, containing ſilver, arſenic, and ſulphur.

4. Ores conſiſting of metallic ſubſtances mineraliſed by *ſaline matters*. Such are the *native vitriols*. Such alſo is probably the *corneous ſilver-ore*, which, according to Mr Cronſtedt's opinion, is a luna cornea, or ſilver combined with marine acid. Of this kind of ores, or native metallic ſalts, is perhaps the *ſedative ſalt of borax*, which from Mr Cadet's experiments, publiſhed in the Memoirs of the Royal Academy for the year 1766, is conjectured to be copper combined with marine acid, and which has been ſaid to be found native. To this claſs alſo may be referred the *ſilver mineraliſed by an alkaline ſubſtance*, which Mr Von Juſti pretends to have diſcovered.

Henckel, and after him Cramer, and the author of the Dictionary of Chemiſtry, pretend, that in mineraliſed ores, beſides the abovementioned metallic and mineraliſing ſubſtances, are alſo contained a metallic and an unmetallic earth. But Wallerius affirms, that the exiſtence of ſuch earths cannot be ſhown, and that ſulphur is incapable of diſſolving unmetallic earths, and even the calces of all metallic ſubſtances, excepting thoſe of lead, biſmuth, and nickel.

Metals and *metalliferous ores* are found in various places.

I. *Under water*; in beds of rivers, lakes, and ſeas, and chiefly at the flexures of theſe: ſuch are the auriferous and ferrugineous ſands, grains of native gold, ochres, and fragments of ores waſhed from mines.

II. *Diſſolved in water*: ſuch are the vitriolic waters containing iron, copper, or zinc.

III. *Upon the ſurface of the earth*. Such are many ochres; metalliferous ſtones, ſands, and clays; and lumps of ores. Mr Gmelin ſays, that in the northern parts of Aſia ores are almoſt always found upon or near the ſurface of the ground.

IV. *Under the ſurface of the earth*. When the quantity of theſe collected in one place is conſiderable, it is called a *mine*.

Subterranean metals and ores are differently diſpoſed in different places.

1. Some are *infixed in ſtones and earths*, forming *nodules* or *ſpots* diverſely coloured.

2. Some are equably and *uniformly diffuſed through the ſubſtance of earths and ſtones*, to which they give colour, denſity, and other properties. Such are the greateſt part of thoſe earths, ſtones, ſands, clays, cryſtals, flints, gems, and fluors, which are coloured.

3. Some form *ſtrata* in mountains. Such are the ſlates containing pyrites, copper-ore, lead-ore, ſilver-ore, or blend. Theſe lie in the ſame direction as the ſtrata of ſtones betwixt which they are placed; but they differ from the ordinary ſtrata in this circumſtance, that the thickneſs of different parts of the ſame metalliferous ſtratum is often very various; whereas the thickneſs of the ſtony ſtrata is known to be generally very uniform.

4. *Fragments of ores* are frequently found accumulated in certain ſubterranean cavities, in fiſſures of mountains, or interpoſed betwixt the ſtrata of the earth. Theſe are looſe, unconnected, frequently involved in clay, and not accreted to the contiguous rocks or ſtrata immediately, nor by intervention of ſpar or of quartz, as the ores found in veins are. Tin and iron mines are frequently of the kind here deſcribed.

5. Large entire maſſes of ores ſometimes found in the ſtony ſtrata of mountains. Theſe are improperly called *accumulated veins*, becauſe their length, relatively to their breadth and depth, is not conſiderable.

6. Some inſtances are mentioned of *entire mountains* conſiſting of ore. Such is the mountain Taberg in Smoland; and ſuch are the mountains of Kerunavara and Luoſavara in Lapland, the former of which is 1400 perches long and 100 perches broad. Theſe mountains conſiſt of iron-ore.

7. Laſtly, and chiefly, metals and ores are found in

oblong tracts, forming maſſes called *veins*, which lie in the ſtony ſtrata compoſing mountains. See the article MINE.

SECT. III. *Of the Pyrites.*

PYRITE is a mineral reſembling the true ores of metals, in the ſubſtances of which it is compoſed, in its colour or luſtre, in its great weight, and, laſtly, in the parts of the earth in which it is found, ſince it almoſt always accompanies ores. It is, like ores, compoſed of metallic ſubſtances, mineralized by ſulphur or by arſenic, or by both theſe matters, and of an unmetallic earth intimately united with its other principles.

Notwithſtanding the conformity of pyrites with ores properly ſo called, ſome chemiſts and metallurgiſts diſtinguiſh the former from the latter minerals; becauſe the proportion and connection of the materials compoſing the pyrites differ much from thoſe of ores. Thus, although ſometimes pyrites contains more metal than ſome ores, yet generally it contains leſs metal, and a larger quantity of mineraliſing ſubſtances, ſulphur and arſenic, and particularly of unmetallic earth. The connection of theſe matters is alſo much ſtronger in pyrites than in ores, and they are accordingly much harder; ſo that almoſt every pyrites can ſtrike ſparks from ſteel.

From the above property of ſtriking ſparks from ſteel, they have been called *pyrites;* which is a Greek word ſignifying *fire-ſtone*. Pyrites was formerly uſed for fire-arms, as we now uſe flints: hence it was called *carabine-ſtone*. It is ſtill named by ſome, *marcaſite*. Perhaps no other kind of natural body has received ſo many names. Perſons curious to know the other names leſs uſed than thoſe we have mentioned, may find them in *Henckle's Pyritologia*. We think, with that celebrated chemiſt, that the ſubject has been perplexed by this multiplicity of names; for before his great and excellent work, the notions concerning pyrites were very confuſed and inaccurate.

Pyrite differs alſo from ores by its forms and poſitions in the earth. Although pyritous metals generally precede, accompany, and follow veins of ores; they do not, properly ſpeaking, themſelves form the oblong and continued maſſes called *veins*, as ores do; but they form maſſes ſometimes greater and ſometimes ſmaller, but always diſtinct from each other. Large quantities of them are often found unaccompanied by ores. They are formed in clays, chalk, marles, marbles, plaſters, alabaſters, ſlates, ſpars, quartz, granites, cryſtals, in a word, in all earths and ſtones. Many of them are alſo found in pit-coals and other bituminous matters.

Pyrites is alſo diſtinguiſhable from ores by its luſtre and figure; which is almoſt always regular and uniform, externally or internally, or both. Some ores indeed, like thoſe of lead, many ores of ſilver, and ſome others, have regular forms, and are in ſome manner cryſtallized; but this regularity of form is not ſo univerſal and ſo conſpicuous in ores as in pyrites. The luſtre of pyrites ſeems to be cauſed by its hardneſs, and the regularity of its form by the quantity of mineraliſing ſubſtances which it contains.

By all theſe marks we may eaſily, and without analyſis, diſtinguiſh pyrites from true ores. When we ſee a mineral that is heavy, poſſeſſed of metallic luſtre, and of any regular form, the maſs of which appears evidently to be entire, that is, not to have been a fragment of another maſs, and which is ſo hard as to be capable of ſtriking ſparks from ſteel, we may be aſſured that ſuch a mineral is a pyrites, and not an ore.

The claſs of pyrites is very numerous, various, and extenſive. They differ one from another in the nature and proportions of their component parts, in their forms, and in their colours. The forms of theſe minerals are exceedingly various. No ſolid, regular or irregular, can eaſily be conceived, that is not perfectly imitated by ſome kind of pyrites. They are ſpherical, oval, cylindrical, pyramidal, priſmatical, cubic; they are ſolids with 5, 6, 7, 8, 9, 10, &c. ſides. The ſurface of ſome is angular, and conſiſts of many baſes of ſmall pyramids; while their ſubſtance is compoſed of theſe pyramids, the points of which all unite in the centre of the maſs.

Pyritous minerals differ alſo in their component ſubſtances. Some of them are called *ſulphureous*, *martial*, *cupreous*, *arſenical*, as one or other of theſe ſubſtances predominate. We muſt obſerve with Henckel, whoſe authority is very great in this ſubject, that in general all pyrites are martial; as ferruginous earth is the eſſential and fundamental part of every pyrites. This earth is united with an unmetallic earth, with ſulphur or arſenic, or with both theſe matters; in which caſe, the ſulphur always predominates over the arſenic, as Henckel obſerves. He conſiders theſe as the only eſſential principles of pyrites; and believes that all the other matters, metallic or unmetallic, which are found in it, are only accidental; amongſt which he even includes copper, although ſo much of it exiſts in ſome kinds of pyrites, that theſe are treated as ores of copper, and ſometimes contain even 50lb. of copper each quintal. Many other metals, even gold and ſilver, are ſometimes combined in pyrites; but theſe are leſs frequent, and the precious metals always in very ſmall quantities; they are therefore juſtly to be conſidered as accidental to pyrites. The different ſubſtances compoſing pyrites ſenſibly affect its colours. Henckel diſtinguiſhes them in general into three colours, white, yellowiſh, or a pale yellow, and yellow. He informs us, that theſe three colours are often ſo blended one with another, that they cannot be eaſily diſtinguiſhed unleſs when compared together.

The white pyrites contain moſt arſenic, and are ſimilar to cobalt and other minerals abounding in arſenic. The Germans call them *miſpickle*, or *miſpilt*. Iron and arſenic form the greateſt part of this pyrites. As arſenic has the property of whitening copper; ſome pyritous minerals almoſt white, like that of Chemnitz in Miſnia, are found to contain 40 pounds of copper per quintal, and which are ſo much whitened by the arſenic, that they are very like white pyrites. But Henckel obſerves, that theſe pyritous matters are very rare, and are never ſo white as the true white pyrites, which is only ferruginous and arſenical.

Yellowiſh pyrites is chiefly compoſed of ſulphur and iron. Very little copper and arſenic are mixed with any pyrites of this colour, and moſt of them contain none of theſe two metallic ſubſtances. This is the moſt common kind of pyrites: it is to be found almoſt every where. Its forms are chiefly round, ſpherical, oval, flattened, cylindrical; and it is compoſed internally of needles or radii, which unite in the centre, or in the axis of the ſolid.

Yellow pyrites receives its colour from the copper and ſulphur which enter into its compoſition. Its colour, however, is inclined to a green; but is ſufficiently yellow to diſtinguiſh it from the other two kinds of pyrites, particularly when they are compared together. To make this compariſon well, the pyrites muſt be broken, and the internal ſurfaces muſt be placed near each other. The reaſon of this precaution is, that the colour of minerals is altered by expoſure to the air.

Perſons accuſtomed to thoſe minerals can eaſily diſtinguiſh them. The chief difficulty is, to diſtinguiſh white pyrites from cobalt and other minerals; which alſo contain ſome copper and much arſenic.

Hence then we ſee, that arſenic is the cauſe of whiteneſs in pyrites, and is obtained in every pyrites of that colour; that copper is the principal cauſe of the yellow colour of pyrites; and that every pyrites which is evidently yellow contains copper; that ſulphur and iron produce a pale-yellow colour, which is alſo produced by copper and arſenic; hence ſome difficulty may ariſe in diſtinguiſhing pyrites by its colours. We may alſo obſerve, that ſulphur and arſenic, without any other ſubſtance, form a yellow compound, as we ſee from the example of orpiment or yellow arſenic. Thus, although the colours of the pyrites enable us to diſtinguiſh its different kinds, and to know their nature at firſt ſight, particularly when we have been accuſtomed to obſerve them; yet we cannot be entirely certain concerning the true nature of theſe minerals, and even of all minerals in general; that is to know preciſely the kinds and proportions of their component ſubſtances, but by chemical analyſis and decompoſition.

Beſides the abovementioned matters which compoſe pyrites, it alſo contains a conſiderable quantity of unmetallic earth; that is, an earth which cannot by any proceſs be reduced to metal. Henckel, Cramer, and all thoſe who have examined this matter, mention this earth, and prove its exiſtence.

We ought to obſerve, that this earth is combined with the other principles of the pyrites, and not merely interpoſed betwixt its parts. It muſt therefore be diſtinguiſhed from other earthy and ſtony matters mixed accidentally with pyrites, and which do not make a part of the pyrites, ſince they may be ſeparated by mechanical means, and without decompoſing that mineral: but the earth of which we now treat is intimately united with the other conſtituent parts of the pyrites, is even a conſtituent part of pyrites, and eſſential to the exiſtence of this mineral, and cannot be ſeparated but by a total decompoſition of it.

According to Henckel, this unmetallic earth abounds much in the white pyrites, ſince he found from the analyſes which he made, that the iron, which is the only metal exiſting in theſe pyrites, is only about $\frac{1}{20}$th part of the fixed ſubſtance that remains after the arſenic has been expelled by torrefaction or ſublimation.

A much larger quantity of iron is in the pale yellow pyrites, according to Henckel. The proportion of iron is generally about 12 pounds to a quintal of pyrites, and ſometimes 50 or 60 pounds: this is therefore called *martial pyrites*. It contains about one-fourth of its weight of ſulphur, and the reſt is unmetallic earth.

The quantity of unmetallic earth contained in the yellow or cupreous pyrites, which are alſo martial, ſince, as we have obſerved, iron is an eſſential part of every pyrites, has not yet been determined. They probably contain ſome of that earth, though perhaps leſs of it than the others.

The nature of this unmetallic earth of pyrites has not been well examined. Henckel thinks that it is an earth diſpoſed already by nature to metalliſation, but not ſufficiently elaborated to be conſidered as a metallic earth. This opinion is not improbable; but as alum may be obtained from many pyrites, may we not ſuſpect that this unmetallic earth is of the nature of the baſis of alum or argillaceous earth? Perhaps alſo this earth is different in different kinds of pyrites. The ſubject deſerves to be well examined.

Although pyrites are not ſo valuable as true ores, becauſe in general it contains leſs metal, and but exceedingly little of the precious metals; and becauſe its metallic contents are ſo difficult to be extracted, that, excepting cupreous pyrites, which is called *pyriteus copper ore*, it is not worked for the ſake of the contained metal; yet it is applied to other purpoſes, and furniſhes us with many uſeful ſubſtances; for from it we obtain all our green and blue vitriols, much ſulphur, arſenic, and orpiment. *See the principal proceſſes by which theſe ſubſtances are extracted from pyrites, under the* ſection SMELTING *of* ORES.

As all pyrites contain iron, and moſt of them contain alſo ſulphur; as the pyrites moſt frequently found contains only theſe two ſubſtances with the unmetallic earth; and as iron and ſulphur have a ſingular action upon each other when they are well mixed together and moiſtened; hence many kinds of pyrites, particularly thoſe which contain only the principles now mentioned, ſuſtain a ſingular alteration, and even a total decompoſition, when expoſed during a certain time to the combined action of air and water. The moiſture gradually penetrates them, divides and attenuates their parts; the acid of the ſulphur particularly attacks the martial earth, and alſo the unmetallic earth; its inflammable principle is ſeparated from it, and is diſſipated. While theſe alterations happen, the pyrites changes its nature. The acid of the ſulphur which is decompoſed, forms with the fixed principles of the pyrites, vitriolic, aluminous, and ſelenitic ſalts; ſo that a pyrites, which was once a ſhining, compact, very hard mineral, becomes in a certain time a greyiſh, ſaline, powdery maſs, the taſte of which is ſaline, auſtere, and ſtyptic.

Laſtly, if this maſs be lixiviated with water, cryſtals of vitriol, and ſometimes of alum, according to the nature of the pyrites employed, may be obtained by evaporation and cryſtallization.

This alteration and ſpontaneous decompoſition of pyrites, is called *effloreſcence* and *vitriolization;* becauſe the pyrites becomes covered with a ſaline powder, and becauſe vitriol is always formed. This vitriolization is more or leſs quickly accompliſhed in pyrites according to its nature. It is a kind of fermentation excited by moiſture amongſt the conſtituent parts of theſe minerals; and it is ſo violent in thoſe which are moſt diſpoſed to it, that is, in the pale yellow pyrites, which contain chiefly ſulphur and iron, that when the quantity of theſe is conſiderable, not only a ſulphureous vapour and heat may be perceived but alſo the whole kindles and burns intenſely. The ſame phenomena are obſervable, and the ſame reſults are formed, by mixing well together, and moiſtening a large quantity of filings of iron and powdered ſulphur; which experiment Lemeri has made to explain the cauſes of ſubterranean fires and volcanoes.

We cannot doubt that, as the earth contains very large maſſes of pyrites of this kind, they muſt undergo the ſame changes when air and moiſture penetrate the cavities containing them; and the beſt natural philoſophers agree, that very probably this ſurpriſing decompoſition of pyrites is the cauſe of ſubterranean fires, of volcanoes, and of mineral waters, vitriolic, aluminous, ſulphureous, hot and cold.

No other pyrites is ſubject to this ſpontaneous decompoſition when expoſed to humid air, but that which is both martial and ſulphureous; that is, the pale-yellow pyrites. The arſenical pyrites, or that which contains little or no ſulphur, is not changed by expoſure to air. This latter kind is harder, heavier, and more compact than the former. The pyrites which is angular and regularly ſhaped, is chiefly of this kind. Mr Wallerius, in his Mineralogy, propoſes to diſtinguiſh this kind of pyrites by the name of *marcaſite.* When cut, it may be poliſhed ſo well as to give a luſtre almoſt equal to that of diamonds, but without refracting or decompoſing the light; for it is perfectly opaque. It has been employed ſome years paſt in the manufacture of toys, as of buckles, necklaces, &c. and is called in commerce *marcaſite.*

We cannot, however, concur with Mr Macquer (from whom the above is taken), in thinking that there is ſufficient reaſon for conſidering the minerals called *pyrites,* as a diſtinct claſs of ſubſtances from ores. They have indeed no mark by which they can certainly and conſtantly be diſtinguiſhed from theſe. The hardneſs or property of ſtriking ignited ſparks from ſteel is not common to all the ſubſtances generally called *pyrites;* for we find ſome of theſe enumerated by mineralogiſts which have not that property. Wallerius even mentions a pyrites which contains no iron, altho' that metal is thought by Henckel to be eſſential to pyrites. The diſtinction of pyrites from ores has been chiefly introduced by miners; becauſe the greateſt part of the former minerals contain ſo little metal, and ſo much of the mineraliſing ſubſtances, ſulphur or arſenic, that they are ſeldom ſmelted. Nevertheleſs, ſome kinds of pyrites are found which contain ſo much copper, that they are ſmelted with great profit. Accordingly, ſome later mineralogiſts conſider the cupreous yellow pyrites as an ore of copper, the pale-yellow martial pyrites as an ore of iron; aud the white arſenical pyrites as an ore of arſenic. See *Ores* of *Copper, Iron,* and of *Arſenic,* below.

SECT. IV. *Eſſaying of Ores in general.*

ESSAYS are chemical operations made in ſmall, to determine the quantity of metal or other matter which is contained in minerals; or to diſcover the value or purity of any maſs of gold or ſilver. The former kind is the ſubject of the preſent ſection; the latter is treated under the word ESSAYS, in the order of the alphabet.

Before eſſays of ores can be well made, a preliminary knowledge of the nature of the ſeveral metallic minerals ought to be attained. Each metal has its proper and improper ores, which have peculiar characters and appearances: hence perſons accuſtomed to ſee them, know pretty nearly by the appearance, weight, and other obvious qualities, what metal is contained in a mineral. A good eſſayer ought to be very intelligent in this matter, that he may at once know what the proper operations are which are requiſite to the eſſay of any given mineral.

As metals are very unequally diſtributed in their ores, we ſhould be apt to make falſe and deceitful eſſays, if we did not uſe all poſſible precautions that the proportionable quantity of metal produced by an eſſay ſhall be nearly the medium contained in the whole ore. This is effected by taking pieces of the mineral from the ſeveral veins of the mine if there be ſeveral, or from different places of the ſame vein. All theſe minerals are to be ſhaken together with their matrixes. The whole is to be well mixed together, and a convenient quantity of this mixture is to be taken for the eſſay. This is called the *lotting* of the ore.

As eſſays, particularly the firſt, are generally made in ſmall, eſſayers have very ſmall weights correſponding to the weights uſed in the great; that is, to the quintal or hundred pounds weight, to pounds, ounces, drams, &c. The eſſay quintal and its ſubdiviſions vary according to the difference of weights in different countries; and this occaſions ſome confuſion when theſe weights are to be adjuſted to each other. Tables of theſe weights are found in treatiſes of eſſaying; and particularly in that written by Schlutter, and tranſlated and rendered more complete by Hellot, which contains all the details neceſſary for the ſubject.

The cuſtom is to take, for the eſſay quintal, a real weight of a gros, or a dram, which in France is equal to 72 grains; but as the whole dram repreſents 100 pounds, each grain repreſents a pound and a fraction of a pound; and hence ſome difficulty and a confuſion ariſe in making the ſubdiviſions. A better method is that of Mr Hellot, which is to make the fictitious or eſſay quintal equal to 100 real grains, and then each grain repreſents a real pound. This eſſay quintal, is ſufficiently exact for ores of lead, tin, copper, iron, antimony, biſmuth, and mercury. But for ores of ſilver and gold, another repreſentation is convenient: for theſe metals, as Mr Hellot ſays, are generally in ſo ſmall quantity, that the button or ſmall piece of metal obtained in the eſſay could not be accurately weighed if 100 real grains were made to repreſent a quintal; and the difficulty of ſeparating the gold from ſo ſmall a quantity would be ſtill greater. Theſe motives have induced Mr Hellot to uſe for theſe ores a fictitious quintal 16 times bigger; that is, equal to 1600 real grains, which repreſent 1600 ounces; that is, 100 lb. or quintal. The ounce being repreſented by a grain, its ſeveral ſubdiviſions muſt be repreſented by fractions of a grain. Thus 12 grains of the fictitious quintal correſpond with $\frac{5}{48}$ of a real grain (†); and this latter quantity may be accurately weighed in eſſay-balances: which when well made are ſenſible to a much leſs weight. See *(Eſſay)*-BALANCE.

When a quintal of an ore to be eſſayed has been weighed, and lotted, as we deſcribed above, it is to be roaſted in a teſt under a muffle. It is to be waſhed, if neceſſary; and, in ſhort, the ſame operations are to be made in ſmall which are uſually done in great. Additions alſo are to be made, and in proper proportions, according to the peculiar nature of the ore. The fluxes generally mixed with the eſſays in ore are three, four, or five parts of black flux; one, two, or three parts of calcined borax; and one half of that quantity of decrepitated common ſalt. The more refractory the ore is, the more neceſſary is the addition of theſe fluxes: then the whole mixture is to be fuſed either in a forge or in a melting or eſſay furnace.

To make eſſays well, all poſſible attention and accuracy are to be employed. This object cannot be too much attended to; for the leaſt inaccuracy in weighing, or loſs of the ſmalleſt quantity of matter, might cauſe errors, ſo much greater as the diſproportion betwixt the weights employed and thoſe repreſented is greater. The moſt minute accuracy therefore is neceſſary in theſe operations. For inſtance, the eſſay-balances ought to be ſmall, and exceedingly juſt. The ore ought not to be weighed till it has been reduced to groſs powder fit for roaſting; becauſe ſome of it is always loſt in this pulverization. When the ore is roaſted, it ought to be covered with an inverted teſt; becauſe moſt ores are apt to crackle and diſperſe when firſt heated. To make the fuſion good and complete, the preciſe degree of fire which is requiſite ought to be employed; and when it is finiſhed, the crucible ought to be ſtruck two or three times with ſome inſtrument, to facilitate the diſengagement of the parts of the regulus from the ſcoria, and to occaſion their deſcent and union into one button of metal. The crucible ought not to be broken, nor its contents examined, till it is perfectly cold.

Upon breaking the crucible, we may know that the fuſion has been good, if the ſcoria be neat, compact, and equal; if it has not overflowed or penetrated the crucible; if it contain no metallic grains; and if its ſurface be ſmooth, and hollowed in the middle. The regulus or button ought to be well collected, without holes or bubbles, and to have a neat convex ſurface; it is then to be ſeparated from the ſcoria, well ſcraped and cleaned; and, laſtly, is to be weighed. If the operation has been well made, its weight ſhows the quantity of metal which every real quintal of ore will yield in the great. If the perfect ſucceſs of this eſſay be in any reſpect doubtful, it ought to be repeated; but the beſt method at all times is, to make ſeveral eſſays of the ſame ore. Some ſmall differences are always found, however well the eſſays may have been made. By taking the medium of the reſults of the ſeveral operations, we may approach as nearly as poſſible the true product of the ore.

Laſtly, as mines are not worked, nor founderies eſtabliſhed (which cannot be done without conſiderable expence), till the ore has been eſſayed, 10 or 12 real pounds of the ore ought to be previouſly eſſayed; and eſſayers ought to be furniſhed with neceſſary furnaces and inſtruments for theſe larger eſſays.

In Part II. to the ſeveral articles of the ores of metals, we ſhall add the moſt approved method of eſſaying theſe ores. We ſhall here only further obſerve in general, that the methods commonly practiſed for eſſaying ores of imperfect metals, and ſemimetals eſpecially, are inſufficient to procure the whole quantity of metal contained in ores, or even ſo much as is obtained in the ſmelting of large quantities of ores; and that therefore the reſult of eſſays is not to be conſidered as the preciſe quantity contained in an ore, but generally only as an inaccurate approximation to that quantity. M. Gellert aſcribes one cauſe of the want of ſucceſs of theſe operations to the alkaline ſalts employed as fluxes to the ores, by which moſt metallic calces are partially ſoluble, but more eſpecially ſo when any of the ſulphur of the ore remains; which, by uniting with theſe ſalts, forms a hepar of ſulphur which is the moſt powerful of all ſolvents. He propoſes therefore to omit the black flux, and other alkaline ſalts, and to add nothing to the ore but powder of charcoal and ſome fuſible glaſs. This method, he ſays, he learned from Mr Cramer, and has himſelf uſed with much ſucceſs in the eſſays of iron and copper: but finding that other imperfect metallic ſubſtances could not ſuſtain the heat neceſſary to effect the fuſion and vitrification of the unmetallic parts of the ore without being partly diſſipated, he found it neceſſary to add in the eſſays of theſe latter metallic matters ſome borax, by which the fuſion might be completed with leſs heat. As we conſider this as a conſiderable improvement in the art of eſſaying ores, we ſhall, to the articles of the ſeveral ores, add not only the proceſſes commonly preſcribed, but all thoſe of Mr Gellert, according to the method here mentioned.

PART II.

Containing a ſummary Deſcription of the principal ORES of each METAL, and the Methods of Eſſaying them.

SECT. I. *Ores of Gold.*

§ 1. PROPERLY ſpeaking, no ores of gold exiſt: for as this metal cannot be allayed with arſenic, nor with ſulphur, it is never found directly mineraliſed by theſe ſubſtances, as the other metals are. In the ſecond place, if it be mineraliſed indirectly by the union it contracts with other metals naturally combined with ſulphur and arſenic, ſo ſmall a quantity of it only is found in theſe ores, that they

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† The pounds, of which 100 are here ſuppoſed to make a quintal, are called Paris pounds, one of which contains 1269 Troy grains.

Ores of Gold.

they ſcarcely even deſerve the name of *improper ores of of gold*.

Hence gold is found either in its natural ſtate, of a certain degree of purity, poſſeſſed of all its properperties; or engaged with ſome other metals in certain minerals.

The gold which is found alone is called *native* or *virgin gold*. This is generally incruſted, and fixed in different kinds of ſtones, principally in flints and quartz. Mr Cramer ſays, that the yellow brilliant ſpots of the blue ſtones called *lapis lazuli*, are native gold; but theſe are very ſmall.

Gold is alſo found in fat and muddy earths; and Mr Cramer affirms, that ſcarcely any ſand can be found which does not contain gold; but he acknowledges, at the ſame time, that the quantity is too ſmall to compenſate for the expence of obtaining it.

Laſtly, the largeſt quantity of native gold is to be found in the ſands of ſome rivers. It is chiefly collected in hollows at the bottom of theſe rivers, and at their ſeveral bendings. The gold is collected in theſe places by a natural operation, ſimilar to that of waſhing of ores.

A conſiderable quantity of gold is in the ſands of ſeveral rivers in France: ſo that perſons who collect it find enough to compenſate their trouble. Mr Reaumur, in a memoir that he gave in the year 1718 concerning the rivers of France which contain gold, enumerates ten of them: namely, the Rhine, the Rhone, the Doux, the Ceze, and the Gardon; the Arriege; the Garonne; two ſtreams which flow into the Arriege, called *Ferriet* and *Benagues*; laſtly, the Salat, the ſource of which is in the Pyrenean mountains.

The Ceze is the river which furniſhes the largeſt quantity of gold at certain times. Mr Reamur obſerves, that its particles are larger than thoſe of the Rhine and of the Rhone; and ſays, that in ſome days a peaſant will find gold to the value of a piſtole, and in others will ſcarcely find any.

The native gold found in rivers or elſewhere is never perfectly pure, or of 24 karats. It always contains a certain quantity of allay, which is generally ſilver. The gold of the French rivers, according to Mr Reaumur's trials, was found to be from 18 to 22 karats, that of the Ceze being the loweſt, and that of the Arriege being the pureſt.

Although gold, however, as above obſerved from Macquer, cannot be directly diſſolved by ſulphur, yet it probably may be mineraliſed by the intervention of other metallic matters. Thus, although no proper ore of gold exiſts, yet it is found in ſeveral mineral ſubſtances, in which it is always accompanied, as Cramer affirms with a much larger quantity of ſilver; to which latter metal that author attributes its mineraliſed ſtate. The minerals containing gold are blend, cupreous and arſenical pyrites, ore of antimony, cinnabar, white ore of arſenic, vitreous and other ſilver ores, and the lead-ore called *galena*.

Gold is more frequently embedded in quartz than in any other matrix, but is alſo found in limeſtone and in hornblend. Gold mines are in general very precarious, as they do not form regular veins, nor is the gold uniformly diſtributed through a matrix.

Eſſaying of Ores of Gold.

Becher and Cramer think, that no ſand is entirely free from gold. The yellow, red, black, and violet-coloured ferruginous ſands, are ſaid to contain moſt gold. Mr Hellet relates, that in 11 eſſays of one kind of ſand, from a quintal or 921,600 grains, were obtained each time from 848 to 844 grains of noble metal, excluſive of the gold which remained in the ſcoria; and that of the metal thus obtained two thirds were gold, and the remaining third was ſilver. He ſays, that parcels of ſand taken up at very ſmall diſtances from each other contained very unequal proportions of gold.

The gold found in ſands is generally leſs pure than that which is imbedded in a ſolid matrix. Reaumur ſays, that a piece of gold, weighing 448 ounces, was ſhown to the Royal Academy at Paris, which was found upon eſſay to have different fineneſs in different parts of the maſs.

§ 2. *Ores and earths containing gold may be eſſayed* by the methods directed for the extraction of gold from large quantities of theſe auriferous matters, (ſee Part III.): or they may in general be eſſayed by being fuſed in a cupel or teſt, placed under the muffle of an eſſay-furnace, or in a crucible placed in an air furnace, with eight or ten times their quantity of lead if they be eaſily fuſible, and with a larger quantity of lead if they be difficultly fuſible; and by ſcorifying the earthy matters, while the lead becomes impregnated with the noble metals. Theſe operations are entirely ſimilar to thoſe employed for the ſeparation of ſilver from its ores by precipitation with lead; *a detail of which ſee ſubjoined under the ſection* ORES *of* SILVER, [*Proceſſes* I. III. IV. V. VI.]. Theſe metals are afterwards to be ſeparated from the lead by cupellation, in the manner directed in the article ESSAY (*of the value of ſilver and of gold*). The gold is then to be ſeparated from the ſilver by the proceſſes deſcribed in the article PARTING.

The quantity of lead to be added to the ore in this eſſay muſt be ſuch as renders the ſcoria very thin, that the whole gold may be imbibed by the lead. Some iron ores containing gold cannot be reduced into a ſcoria ſufficiently thin with 16 times their quantity of lead, unleſs the heat be at the ſame time conſiderably increaſed. When the ore is exceedingly refractory, the ſcorification ought to be promoted by adding to it four times its quantity of tartar, twice its quantity of nitre, and four times its quantity of litharge. This mixture is to be put into a good eſſay-crucible, and covered with the ſea-ſalt. The crucible is to be ſet in a forge-hearth, and expoſed gradually to heat, till the ſcoria has acquired ſufficient fluidity, and the lead has imbibed the noble metal.

See the methods which have been uſed for eſſaying auriferous ſands, under Part III.

SECT. II. *Ores of Platina.*

PLATINA is very rare, and has been but lately diſcovered. As, like gold, it cannot be allayed with ſulphur or with arſenic, probably no *ore*, properly ſo called, exiſts of this metal. Accordingly in the only mines of platina which we know, namely, the gold mines of Santafe near Carthagena, the platina is found native like the gold, and in its metallic ſtate.

Ores of Silver.

Ores of Silver.

SECT. III. *Ores of Silver.*

§ 1. Next to gold, ſilver is the metal moſt frequently found in its metallic ſtate, that is, not mineraliſed by ſulphur or by arſenic. This ſilver, called alſo *native* or *virgin*, generally affects ſome regular form, and conſiſts of filaments or vegetations of various figures. It is found in form of plates, of fibres, or of grains, or cryſtallized. It lies generally in quartz, flint, ſpar, ſlate, cobalt, and in ſilver ores. It is ſometimes enveloped in a thin ſtony cruſt. It is generally allayed with ſome gold : but ſilver, like all the other metals, is much more frequently found mineraliſed by ſulphur and by arſenic.

Three principal proper ores of ſilver are known, which are very rich, but very rare. Theſe are :

1. The *vitreous ſilver ore.* This ore has no determinate figure, and has nearly the colour, ſoftneſs, and fuſibility of lead. It is very heavy, and contains three quarters of its weight of pure ſilver. In this ore the ſilver is mineraliſed by ſulphur alone. Some expert artiſts imitate it very well by combining ſulphur with ſilver by fuſion in a crucible.

This ore, according to Cronſtedt, is either in form of plates or of fibres, or is cryſtallized, or has no determinate figure. It may be imitated by adding about five parts of ſulphur to one part of melted ſilver ; in which operation moſt of the ſulphur is conſumed ; or it may be imitated by expoſing a plate of ſilver red-hot to the fumes of burning ſulphur.

2. The *horny* or *corneous ſilver ore.* This ore is ſo called from its colour and ſemitranſparency, by which it reſembles horn or colophony. When ſuddenly heated, it crackles, as almoſt all ores do, and melts with a gentle heat. Two-thirds of it are ſilver, which is mineraliſed by ſulphur and arſenic. This ore is very rare. Wallerius ſays, after Woodward, that it is found at Johaun-Georgen-Stadt in Saxony.

Corneous ore has various colours ; white, pearly, brown, yellow, greeniſh, or reddiſh. It is foliated and ſemitranſparent. It is ſomewhat ductile, and fuſible with the flame of a candle. When heated, it emits, as Wallerius ſays, a ſulphureous and blue flame, and, according to Cramer, alſo a very ſmall quantity of an arſenical fume. Wallerius ſays, that it contains two thirds of ſilver, with a conſiderable quantity of ſulphur, and a ſmall quantity of arſenic. Lehman thinks that it is ſilver united with a little arſenic. But Mr Cronſtedt ſays, that it is a luna cornea, or ſilver combined with marine acid ; and that it is incapable of being decompoſed but by ſubſtances which can unite with that acid. This latter opinion ſeems to be the moſt probable ; as the ore, according to its deſcription, is ſimilar to luna cornea, and as it cannot be imitated by any mixture of ſulphur and of arſenic with ſilver. The blue flame, and the ſmell ſlightly arſenical, which are emitted from heated corneous ore, are alſo obſervable from every combination of marine acid with a ſubſtance containing phlogiſton.

3. *Red ſilver ore,* called alſo *roſiclare.* Its colour is more or leſs red ; it is ſometimes cryſtallized, very heavy, and is fuſible like the abovementioned ores. In this ore the ſilver is mineraliſed by arſenic and by ſulphur, but chiefly by the former. It alſo contains a little iron, and furniſhes two-thirds of its weight of ſilver. Its red colour may proceed either from the iron it contains ; or from the mixture of arſenic and ſulphur ; or, laſtly, from the particular manner in which the arſenic is united with the ſilver, an example of which we have in the red precipitate of ſilver made by the neutral arſenical ſalt.

Red ſilver ore is either plated or ſolid, or cryſtallized, and frequently ſemitranſparent. Its colour is various, from a dark grey to a deep red, according to the proportions of the two mineraliſing ſubſtances. It crackles and breaks in the fire, exhales an arſenical fume, and is readily fuſed. It is found generally in quartz, ſpar, cryſtal, horneblend.

Beſides the three ſilver ores above deſcribed, the following ores contain ſilver mixed with other metals.

1. *Grey ſilver ore.* This contains copper and ſilver mineraliſed by arſenic and ſulphur, and generally more of the former than of the latter metal ; but as it is valued chiefly for the ſilver, it has been generally enumerated amongſt ſilver ores.

2. *White ſilver ore* is an arſenial pyrites containing ſilver.

3. *Black ſilver ore* contains ſulphur, arſenic, copper, iron, ſometimes lead, and about a fourth part of ſilver, according to Wallerius.

4. *Plumoſe ſilver ore* is white or black, ſtriated like plumb-alum, or like ore of antimony. It is ſilver mineraliſed by ſulphur, arſenic, and antimony.

5. *Pech-blend.* In this blend ſilver, gold, and zinc, are mineraliſed by ſulphur, probably by intervention of iron, by which the gold and zinc are rendered capable of uniting with the ſulphur.

6. Silver is frequently found in *galena ;* and ſometimes in *martial pyrites ;* in the *red ore of arſenic ;* in various *ores of copper, lead, tin, iron,* and eſpecially *cobalt ;* in *blends ;* in *yellow* or *red earths ;* in *black* and *blue baſaltes ;* and alſo in *ſtrata of ſtones* which do not appear externally to contain any mineral ſubſtance.

7. *Liquid ſilver ore* or *guhr of ſilver,* is a grey or whitiſh liquid maſs, which contains, as Wallerius ſays, either native ſilver, or ſome fluid ſubſtances capable of producing it. Mr Cronſtedt mentions, in the Swediſh Memoirs, a water flowing through a mine in Norway containing ſilver. Another inſtance is alſo mentioned of a ſilver guhr, in the *Act. Erud. Upſal.* 1720.

8. Mr Von Juſti pretends, that he has found ſilver mineraliſed by an *alkaline ſubſtance ;* but he has not ſpoken ſufficiently diſtinctly concerning it, to know whether he means a ſaline or earthy alkaline matter. Henckel alſo pretends, that by treating calcareous earth or certain clays with pyrites, ſilver may be obtained.

§ 2. *Ores of ſilver may be eſſayed* by the ſame methods which are employed for the extraction of that metal from large quantities of ores ; which methods are different, and ſuited to the different qualities of the different ores. See Part III. Or, in general, ores and earths containing ſilver may be eſſayed by the following proceſſes, which are copied from Dr Mortimer's Engliſh

Eſſaying of Ores of Silver.

Engliſh edition of *Cramer's Art of eſſaying metals, Part II. Proceſs* 1.

PROCESS I.

To precipitate Silver by means of Lead from fuſible Ores.

"Pound the ore in a very clean iron mortar into fine powder: of this weigh one docimaſtical centner or quintal, and eight of the like centners of granulated lead.

"Then have at hand the docimaſtical teſt, which muſt not as yet have ſerved to any operation; pour into it about half of the granulated lead, and ſpread it with your finger through the cavity of it.

"Put upon this lead the pounded ore; and then cover it quite with the remainder of the granulated lead.

"Put the teſt thus loaded under the muffle of an eſſay-furnace, and in the hinder part of it; then make your fire, and increaſe it gradually. If you look thro' the holes of either of the ſliders, you will ſoon ſee that the pounded ore will be raiſed out of the melted lead, and ſwim upon it. A little after, it will grow clammy, melt, and be thrown towards the border of the teſt: then the ſurface of the lead will appear in the middle of the teſt like a bright diſc, and you will ſee it ſmoke and boil: ſo ſoon as you ſee this, it will be proper to diminiſh the fire a ſmall matter for a quarter of an hour; ſo that the boiling of the lead may almoſt ceaſe. Then again, increaſe the fire to ſuch a degree, that all may turn into a thin fluid, and the lead may be ſeen, as before, ſmoking and boiling with great violence. The ſurface of it will then diminiſh by degrees, and be covered over with a maſs of ſcorias. Finally, have at hand an iron hook ready heated, wherewith the whole maſs muſt be ſtirred, eſpecially towards the border; that in caſe any ſmall parcels of the ore not yet diſſolved ſhould be adherent there, they may be brought down, taking great care not to ſtir any the leaſt thing out of the teſt.

"Now, if what is adherent to the hook during the ſtirring, when you raiſe it above the teſt, melts quickly again, and the extremity of the hook grown cold is covered with a thin, ſmooth, ſhining cruſt; it is a ſign that the ſcorification is perfect; and it will be the more ſo as the ſaid cruſt adherent to the hook ſhall be coloured equally on every ſide: but in caſe, while the ſcorias are ſtirred, you perceive any conſiderable clammineſs in them, and when they adhere in good quantity to the hook, though red-hot, and are inequally tinged, and ſeem duſty or rough with grains interſperſed here and there; it is a ſign that the ore is not entirely turned into ſcorias. In this caſe, you muſt with a hammer ſtrike off what is adherent to the hook-pulverize it, and with a laddle put it again into the teſt, without any loſs or mixture of any foreign body, and continue the fire in the ſame degree till the ſcoria has acquired its perfection and the abovementioned qualities. This once obtained, take the teſt with a pair of tongs out of the fire, and pour the lead, together with the ſcoria ſwimming upon it, into a cone made hot and rubbed with tallow. Thus will the firſt operation of the proceſs be performed, which does not commonly indeed laſt above three quarters of an hour.

Eſſaying of Ores of Silver.

"With a hammer ſtrike the ſcorias off from the regulus grown cold, and again examine whether they have the characteriſtics of a perfect ſcorification; if they have, you may thence conclude, that the ſilver has been precipitated out of the ore turned to ſcorias, and received by the lead.

"When the ſcorification laſts longer than we mentioned, the lead at laſt turns to ſcorias, or litharge and the ſilver remains at the bottom of the veſſel: but the fire muſt be moderately ſupplied, and the veſſels be extremely good, to produce this effect; for they ſeldom reſiſt to the ſtrength of the ſcorias long enough; ſo that the whole ſcorification may be brought to an end; which has afterwards this inconveniency, that the ſilver is diſſipated by grains in the ſmall hollows of the corroded ore, and can hardly be well collected again, when the ore has but little ſilver in it. Nay, there is ſtill more time to be conſumed to obtain the perfect deſtruction of the lead, by means of the combined actions of the fire and air, becauſe the ſcorias ſwimming at the top retard it conſiderably.

"In this proceſs, the ſulphur and the arſenic of the ſilver-ore; when the ore is broken ſmall, and extended widely in a ſmall quantity, are in part eaſily diſſipated by the fire, and in part abſorbed by the lead; the lighter part of which, ſwimming upon the heavier, becomes very clammy by means of the ſulphur which is in the ore; but when this is diſſipated by the violence of fire, it turns into glaſs or ſcorias: but when arſenic is predominant in the ore, the plumbeous part turns immediately into a very penetrating and very fuſible glaſs, having a diſſolving efficacy, unleſs the arſenic lies hidden in a white pyrites or cobalt. For this reaſon, the fixed part of the ore, which is no ſilver, is diſſolved by that glaſs, melts, and aſſumes the form of ſcorias. The unmetallic earths and the pure copper or lead ores thereto adherent are of this kind. The ſilver then remains immutable; and being freed of theſe heterogeneous bodies, which are partly diſſipated and partly melted, it is precipitated and received by the remaining regulus of lead. Therefore this proceſs completed by three diſtinct operations; viz. 1. By roaſting. 2. By ſcorification. 3. By the melting precipitation of the ſilver, which is the reſult of the two former operations.

"The ore muſt be pulveriſed very fine, in order to increaſe the ſurface, that the diſſipation of the volatiles and the diſſolution by litharge may be ſooner effected. This pulveriſing muſt then be done before the ore is weighed, becauſe there is always ſome part of the ore adherent to the mortar or iron plate on which it is made fine; which part being loſt, the operation is not exact. Erker was in the right when he preſcribed eight centners of lead for the ſubduing of fuſible ores. Nevertheleſs, it muſt be owned, that this quantity is ſuperfluous in ſome caſes. However, as the fluxibility of the ſilver-ore depends upon the abſence of ſtones, pyrites, &c. it is eaſy to ſee, that there are an infinite number of degrees of fluxibility which it would be needleſs to determine exactly, and moſt commonly very difficult to determine by the bare ſight. Beſides, a little more lead does not render the proceſs imperfect; on the contrary, if you uſe too

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ſmall a quantity of lead, the ſcorification is never completely made. Nay, there are a great many ores containing ſulphur and arſenic in plenty, that deſtroy a conſiderable quantity of lead; ſuch are the red ſilver-ore, and that wherein there is a great deal of the ſteel-grained lead-ore. If the fire muſt be ſometimes diminiſhed in the middle of the proceſs, it is in order to hinder the too much attenuated litharge, which is continually generated out of the lead, from penetrating the pores of the teſt, and from corroding it; which is eaſily done when the fire is overſtrong; for then the ſurface of the veſſel which is contiguous to the lead contracts cavities, or, being totally conſumed by ſmall holes, lets the regulus flow out of it. The veſſels that are moſt ſubject to this inconvenience are thoſe in the materials of which lime, plaſter, and chalk are mixed. Nay, theſe bodies, which are in their nature refractory, being eroded during their ſcorification, at the ſame time communicate a great clammineſs to the ſcoria; ſo that a great quantity of the maſs remains adherent to the teſt, in the form of protuberances, when you pour it out; whereby a great many grains of the regulus are detained."

PROCESS II.

The regulus obtained by the proceſs I. contains all the ſilver of the ore, and the unſcorified part of the lead. The ſilver may be afterwards ſeparated from the lead, and obtained pure by *cupellation;* which proceſs is deſcribed under the article Essay *(of the value of Silver.)*

PROCESS III.

If the ſilver-ore cannot be waſhed clean, or if it be rendered refractory by a mixture of unmetallic earths and ſtones the ſcorification of theſe earthy matters frequently cannot be completed by the proceſs I. Cramer therefore directs, that ſuch ores ſhall be treated in the following manner.

"Bruiſe the ore into an impalpable powder, by grinding in a mortar; to a docimaſtical centner of it add a like quantity of glaſs of lead finely pulveriſed; for the more exactly theſe two are mixed together, the more eaſily the ſcorification afterwards ſucceeds. Put this mixture, together with 12 centners of lead, into the teſt, according to proceſs I. then put the teſt under the muffle.

"Make firſt under it a ſtrong fire, till the lead boils very well, when you ſee it ſo, diminiſh the violence of the heat, as was directed in the firſt proceſs; but keep it thus diminiſhed a little longer: then, finally, again increaſe the fire to ſuch a degree, till you perceive the ſigns of a perfect ſcorification and fuſion. *See the whole proceſs I.* Now this proceſs laſts a little longer than the foregoing, and requires a greater fire towards the end.

"It ſometimes happens that a very refractory ore cannot be diſſolved by litharge; and that a maſs, which has the clammineſs of pitch, ſwims upon the regulus and upon the ſcorias themſelves which are already ſubdued in part: when you ſee this, ſhut the vents of the furnace to diminiſh the fire; then gently touch this refractory body with a ſmall iron cold hook to which it will immediately ſtick; take it off ſoftly, not to loſe any thing; pound it into a fine powder, adding a little glaſs of lead, and put it again into the teſt; then continue the ſcorification till it is brought to its perfection. But you muſt always examine the ſcoria of your refractory ore, to ſee whether there may not be ſome grains of regulus diſperſed in it; for ſometimes the ſcorias that grow clammy retain ſomething of the metal; which if you ſuſpect, pound the ſcorias into a fine duſt, and thus the grains of metal will appear if there are any left, becauſe they can never be pounded fine. The ſilver is ſeparated from this regulus by cupelling, as in Proceſs II.

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"All earths and ſtones are refractory in the fire: for although ſome of them melt naturally in the fire, as thoſe that are vitrifiable do; nevertheleſs all the others, a very few excepted, melt much more difficultly than metals, and never become ſo thin in the fuſion as is required for the ſufficient precipitation of a precious metal. But litharge itſelf does not conveniently diſſolve theſe refractory matters by the help of fire alone, unleſs you add ſome mechanical mixture to them; for the very moment the ſaid litharge penetrates through the interſtices of the refractory ore, and begins to diſſolve it, a tenacious maſs is produced, which hardly admits any farther dilution by the litharge. You may ſee it plain, if you make coloured glaſſes with metallic calces: if you pour careleſsly upon them a calx that gives a colour, you will never obtain that they may be equally dyed on every ſide, even although you ſhould torture them for whole days together in a great fire. Nay, glaſs already made can never be diluted by only pouring ſalts and litharge upon it. Wherefore you muſt uſe the artifice of glaſs-makers, who, in the making of the moſt perfect glaſſes, take great care, before they put the ſpecies of their ingredients into the fire, to have a mechanical mixture precede, or at leaſt accede, during the fuſion itſelf, which is done here by pounding glaſs of lead mixed with the ore; but if you think that your glaſs of lead is not ſufficiently fuſible, you may add to it litharge melted firſt, and then pounded into a fine powder.

"As this ſcorification requires a longer and a greater fire than the foregoing, and as a greater quantity of litharge is moreover requiſite to ſubdue the refractory ſcoria; it is eaſy to ſee why a much greater quantity of lead muſt be uſed here than in Proceſs I.; and, although leſs lead is often ſufficient it is nevertheleſs proper always to uſe the greateſt quantity that can be neceſſary; leſt, for inſtance, it ſhould be neceſſary to try ſo many times the lead alone to make it evident how much ſilver the lead when alone leaves in the coppel. Nor need you fear leſt any thing of the ſilver be taken away by the lead, provided the coppels be good, and the coppelling duly put in the execution; for you can hardly collect a ponderable quantity of ſilver out of the collected fume of the lead, which riſes during the coppelling, as well as out of the litharge that is withdrawn into the coppel."

PROCESS IV.

If the ore be rendered refractory by pyrites, Cramer directs that the ſilver ſhould be precipitated by lead in the following manner. *(Art of Aſſaying,* Part. II. proc. 4.)

"Break

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"Break your ore into a rough powder, and put a centner of it into the teſt; put upon this another teſt in the manner of a tile; put it under the muffle hardly red hot: increaſe the fire by degrees. There will always be a crackling: which being ended, take away the upper teſt; for when the veſſels have been red-hot about one minute, the ore ceaſes to ſplit. Leave the ore under the muffle till the arſenic and the ſulphur are for the moſt part evaporated; which you will know from the ceſſation of the viſible ſmoke, of the ſmell of garlic, or the acid; then take away the teſt, and leave it in a place not too cold, that it may cool of itſelf.

"Pour out, without any diſſipation, the roaſted ore, and with a knife take away what is adherent to the veſſel; pound it to a moſt ſubtile powder, and grind it together with an equal weight of glaſs of lead; and, finally, ſcorify the whole collected ore in the ſame teſt wherein the teſting was made, unleſs it has contracted chinks, as was deſcribed in Proceſs III.

"*Remarks.* Yellow pyrites-ores contain a very great quantity of ſulphur, even greater than is neceſſary to ſaturate the metal that lies hidden in them.—For which reaſon this ſuperfluous ſulphur diſſipates in a middling fire; but if it had been mixed with lead, it would have rendered it refractory, nor could it afterwards be diſſipated from it without a conſiderable deſtruction of the lead. The white arſenical pyrites turn alſo a great quantity of lead into glaſs, on account of the abundance of the arſenic they contain. For which reaſon theſe ores muſt be previouſly roaſted, that the ſulphur and arſenic may be diſſipated. Nor need you fear leſt any part of the ſilver be carried away with the arſenic; for when arſenic is ſeparated from any fixed body, by a certain degree of fire, it carries nothing of that body away with it."

PROCESS V.

Silver may be precipitated from its ore by cupellation only, in the following Proceſs, given by Cramer. [*Art of Aſſaying, Part* II. *Proc.* 9.]

"Pound one centner of ore; roaſt it in the manner directed in the laſt proceſs; beat it to a moſt ſubtle powder, and if it melts with difficulty on the fire, grind it together with one centner of litharge, which is not neceſſary when the ore melts eaſily: then divide the mixture or the powder of the ore alone into five or ſix parts, and wrap up every one of them ſeverally in ſuch bits of paper as can contain no more than this ſmall portion.

"Put a very large coppel under the muffle; roaſt it well firſt, and then put into it ſixteen centners of lead: when the lead begins to ſmoke and boil, put upon it one of the ſaid portions with the ſmall paper it was wrapt up in, and diminiſh the fire immediately, in the ſame manner as if you would make a ſcorification in a teſt, but in a leſſer time. The ſmall paper, which turns preſently to aſhes, goes off of itſelf, and does not ſenſibly increaſe the maſs of the ſcorias. The ore proceeding therefrom is caſt on the border, and turns to ſcorias very ſoon. Increaſe the fire again immediately, and, at the ſame time, put another portion of the ore into the coppel, as was juſt now ſaid. The ſame effects will be produced. Go on in the ſame manner, till all the portions are thrown in and conſumed in the lead. Finally, deſtroy the remaining lead with a ſtronger fire.

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"The ſilver that was in the ore and in the lead will remain in the coppel. If you deduct from it the bead proceeding from the lead, you will have the weight of the ſilver contained in the ore. If the ore employed was eaſy to be melted, all the ſcoria vaniſhes; but if it was refractory or not fuſible, all the ſcoria does not always go away, but their remains ſomething of it now and then in the form of duſt. A great many ores and metals may be tried in this way, except only ſuch as ſplit and corrode the coppels.—There are likewiſe ſome of them which muſt be previouſly prepared in the ſame manner as is required to render them fit for going through a ſcorification.—*See the foregoing Proceſſes.*

"*Remarks.* The ore thrown at ſeveral times upon lead boiling in a coppel may be diſſolved without the foregoing ſcorification; but this is very far from having an equal ſucceſs with all kinds of ores; for there are ores and metals which reſiſt very much their diſſolution by litharge; and which being on this account thrown on the border, are not ſufficiently diſſolved; becauſe the litharge ſteals away ſoon into the coppel. Nevertheleſs, there are ſome others which vaniſh entirely by this method, except the ſilver and gold that was contained in them.

"A previous roaſting is neceſſary, firſt, for the reaſons mentioned, and then becauſe the ore thrown upon boiling lead ſhould not crackle and leap out; for, having once paſſed the fire, it bears the moſt ſudden heat."

PROCESS VI.

Silver may be precipitated out of the ſame bodies as were mentioned in the foregoing proceſſes by ſcorification in a crucible. [*Cramer, Proc.* 15.]

"The body out of which you intend to precipitate ſilver muſt be previouſly prepared for a ſcorification by pounding and roaſting, as mentioned in the former proceſſes. Then in the ſame manner, and with the ſame quantity of lead, put it into a crucible ſtrictly examined, that it be entire, ſolid, not ſpeckled with black ſpots, like the ſcoria of iron, eſpecially at its inferior parts, and capable of containing three times as much. Add beſides glaſs gall and common ſalt, both very dry, and enough, that when the whole is melted the ſalts may ſwim at top at the height of about half an inch.

"Put the crucible thus loaded in a wind-furnace; ſhut it cloſe with a tile; put coals round it, but not higher than the upper border of the crucible. Then light them with burning coals, and increaſe the fire till the whole melts very thin, which will be done by a middling fire, maintained always equal, and never greater; leave it thus for about one quarter of an hour, that the ſcorification may be perfectly made. Take off the tile and ſtir the maſs with an iron wire, and a little after pour it out into the mould. When the regulus is cleaned from ſcorias, try it in a teſt by coppelling it.

"*Remarks.* The ſcorification of any ore whatever, or of any body fetched out of ores, may indeed

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be made by this apparatus, as well as in a teſt under a muffle: but it ſerves chiefly to the end that a greater quantity of metal may be melted from it with profit. For you may put many common pounds of it at one ſingle time into the crucible; but then you need not obſerve the proportion of lead preſcribed in the foregoing proceſs; nay, a quantity of lead two or three times leſs is ſufficient, according to the different qualities of the object. But the maſs will certainly be ſpilt, unleſs you chooſe a very good crucible; for there is no veſſel charged with litharge that can bear a ſtrong fire having a draught of wind, without giving way through it to the litharge.

"You add glaſs-gall and common ſalt, that they may forward the ſcorification, by ſwimming at top; for the refractory ſcoria rejected by the litharge, and adhering between this and the ſalts that ſwim at top, is ſoon brought to a flux, and the precipitation of the ſilver is thereby accelerated. They alſo hinder in a manner a ſmall burning coal fallen into the crucible, from ſetting the litharge a boiling, which troubles the operation; for the litharge or glaſs of lead, eſpecially that which is made without any addition, ſo ſoon as the phlogiſton gets into it, riſes into a foamy maſs, conſiſting of a multitude of ſmall bubbles very difficult to be confined, unleſs the phlogiſton be entirely conſumed, and the litharge reduced to lead, which ſometimes riſes above the border of the veſſel."

The *corneous ore*, if it really be, as Cronſtedt ſays, a luna cornea, ought to be treated in ſome of the methods directed for the reduction of luna cornea. See CHEMISTRY-*Index*.

PROCESS VII.

Silver and gold may be extracted from their ores by mercury.

A new method of extracting the precious metals by means of amalgamation with mercury has lately been introduced into Germany. The attraction between theſe has indeed been known from the moſt remote antiquity: Vitruvius informs us, that by this means gold might be recovered from embroidery and old cloaths; and Pliny mentions the gilding of braſs and other metals by the ſame means. From time immemorial mercury has been made uſe of in the ſtreaming for gold, in order to purify and collect together the gold duſt which is diſperſed in the ſands; and almoſt all nations who practice this uſe the ſame proceſs. The gold ſand, after being waſhed, is triturated with quickſilver, and the ſuperfluous metal ſeparated by ſtraining through leather. By the miners it was uſed in a ſimilar manner; the ſtones containing gold being firſt pounded and then triturated in mills along with the mercury. But it was ſoon found, that in theſe mills there was a large quantity left behind in the reſiduum, ſo that it was neceſſary to ſubject what was left to the action of fire: on which account the mills were deemed unneceſſary, and are now almoſt every where diſuſed. The proceſs of extracting gold and ſilver by amalgamation, however, was looked upon to be eſſentially deficient, by reaſon of an opinion which prevailed among the chemiſts, that mercury could not diſſolve either of theſe metals except in their pure and perfect ſtate; whence it was ſuppoſed, that a great quantity which fire could have extracted was left by the mercury. This opinion was ſupported by the moſt celebrated metallurgiſts, as Schlutter, Gellert, Wallerius, and Kramer; whence it became generally believed, that amalgamation would never anſwer in great operations. But of late Baron Inigo Born has not only demonſtrated that this can be done to great advantage, but has actually intoduced it, notwithſtanding that ſome difficulties were thrown in his way. The following is an account of the methods which have been practiſed for ſeparating gold and ſilver from their ores by means of quickſilver.

Baron Born's New Proceſs, &c tranſlated by Raſpe, 4to, 1791.

This proceſs was introduced into ſome of the mines of Mexico in 1566 by Don Pedro Fernandez de Velaſco, and in 1571 into ſome of thoſe of Peru by the ſame perſon; and from thence it quickly ſpread thro' all the mines in the ſouth and north-eaſt parts of America, inſomuch that it is almoſt the only method uſed in that part of the world for extracting theſe metals. The richer ores, however, are purified by fuſion with lead; and our author informs us, that formerly the poorer kind of ores were certainly thrown away, and when the method of amalgamation was introduced into Peru, the old barrows were ſearched for the ores which had been rejected as uſeleſs, but were now put to the quickſilver.

In the year 1588, Don Juan de Corduba, a Spaniard, applied to the court of Vienna, propoſing to extract ſilver from its ores, whether poor or rich, by mercury, and in a ſhort ſpace of time. He made ſome experiments upon different kinds of ore, which on a ſmall ſcale ſucceeded very well, but on attempting it with 20 quintals of it he failed; and as Lazarus Erker, who was employed to give in a report concerning it, diſapproved of the method, it was not purſued any farther. The reaſons alledged in Baron Born's book for this failure are, that he did not calcine his ore; that he did not uſe any ſalt; and that the weather was too cold; though this laſt circumſtance might have been remedied had Corduba attended to it.

Another Latin and anonymus account of the mode of amalgamation is preſerved among the records of the aulic chamber. It is directed to the emperor, but the year in which it was written is not mentioned. According to the account given by the author of this paper, he had examined the mines of Guatimala in New Spain, and made ſome uſeful regulations for them. He directs the ore to be calcined in furnaces like limekilns, the fire being kept up according to the nature of the ores, after which they are to be reduced to powder in mills or ſtamps. The pulveriſed matter is then paſſed through fine iron ſieves, and put into earthen or copper veſſels by 10 or 20 quintals at a time; more or leſs ſalt being mixed with it according to circumſtances. The light-coloured ore requires 50 lb. to every thouſand, and the darker ſomewhat more. To this mixture are to be added five pounds of dry tartar two pounds of pulverized horn, and three pounds of brick-duſt. Some kinds of ores require but a ſmall quantity of theſe additions.

After the mixtures are put into the boilers, as much water is added as will make the whole of the conſiſtence of paſte moderately thick; the veſſels muſt be expoſed to ſunſhine, or kept in a place warmed artificially, adding more water when the matter begins to dry; and it

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muſt be ſtirred up three or four times a-day. At the expiration of three or four days, various colours appear upon the ſurface. After this 15 lb. of brimſtone is to be added to every thouſand pounds of ore, and the whole worked over again; but this addition is by the baron conſidered as quite ſuperfluous. Laſtly, 100 lb. or leſs of quickſilver is added, according to the nature of the ore; the whole maſs is carefully worked over, and left at reſt for 10 hours. A fire muſt next be kindled under the boiler, and the matter it contains triturated or ſtirred for two days together; keeping it always ſufficiently diluted by a proportional quantity of water. It is, laſtly, allowed to reſt for 12 hours, and then dried.

When this operation is ſucceſsfully performed, if the ores be rich, particles of amalgam will be ſeen in it: theſe are collected, waſhed out, and kept for further uſe, the leavings being carried to a place fit for waſhing over. This place ought to be on the ſlope of an hill, where a kind of pit is dug out and lined with brick and mortar, and ought to be large enough to contain 25 quintals. A ſtream of water is then made to run upon it, and the matter ſtirred without intermiſſion. The ſuperfluous water runs over the rim of the pit, and carries off the lighter ſtony and earthy particles, the heavy amalgam remaining at bottom. This is then to be mixed with the ſmall clots already mentioned, which were taken out of the maſs originally, and preſſed through a cloth made of hemp or coarſe linen. The quickſilver, which comes through clean, is kept for farther uſe; the remainder diſtilled off in proper veſſels, and the remaining ſilver melted into ingots. By this method it is ſaid that even very poor ores are worked to advantage, the expence being very moderate.

The following method of extracting gold from its ores is very much recommended by our author: "The auriferous ſand, which contains gold grains and gold-duſt, is concentrated by waſhing; and without any calcination goes to the abovementioned waſhing-pit, which for this purpoſe need not be ſo large. On its upper part is fixed a ſquare launder, about 12 feet long, covered in the bottom with a woollen cloth, in order to retain any part of the gold-duſt which may be carried over with the water and ſtuff gently ſtirred in the pit. When the water carries off no more mud, but runs clear, the farther ſupply is to be ſtopped; the water in the pit is pumped or taken out with buckets; the coarſer ſand in the bottom is ſeparated or ſcraped off by hands: and the finer heavieſt ſand at the bottom is mixed with quickſilver. Then it is ſqueezed through a piece of cloth; the quickſilver comes off without any gold, which ſeparated from the ſand remains as an amalgam, and is pure after the remaining quickſilver has been evaporated. The ſand and heavier duſt remaining on the launder is waſhed and treated in the ſame manner.

"The auriferous ores and loadſtones, however, which riſe from different mines, are calcined like ſilver ores, more or leſs as the nature of their matrixes will direct. Then they are ground and ſifted; and the auriferous ſtuff, thus prepared, is put into heaps, expoſed to the ſunſhine, and worked and turned about for three or four days. It requires no ſalt. Afterwards ſulphur, and at laſt quickſilver, are added and mixed with it. There is no occaſion for fire under the veſſel in which it is triturated, except in winter; and two days after, though not dried, it is immediately carried to the waſhing-pit, and treated like the amalgam of ſilver.

"This method of extracting gold and ſilver is ſo certain and ſafe, that when other methods of amalgamation extract only one ounce of gold and ſilver, this produces three or four from the pooreſt ores in a ſhorter time and with leſs expence."

P. Joſeph Acoſta tells us, that at Potoſi 6000 or 7000 quintals of quickſilver are annually conſumed in the dreſſing of the ore, not to mention what is recovered from the leavings of the firſt waſhing. Theſe leavings, called *lamas*, are burnt in particular furnaces in order to extract the remaining quickſilver; and there are upwards of 50 ſuch furnaces near Potoſi and Tarapaja. The ore refined there amounts, according to the beſt information, to the immenſe quantity of 300,000 quintals. Only about 2000 quintals of the quickſilver are recovered, which ſhows a loſs of about two pounds of quickſilver on every quintal of ore. The ores are of different natures, and in proportion to the ſilver they contain require more or leſs quickſilver. That which contains moſt, requires naturally the greateſt quantity of quickſilver; though ſome of the workmen pretend that there is a kind which contains very little ſilver, and yet requires a great deal of mercury: but whether this be owing to the ignorance of the workmen, or to the mercury being abſorbed by ſome other matter, is not generally known. The ore is firſt pulveriſed in mills, and then paſſed through iron or braſs ſieves. The mills will grind, when properly regulated, 30 quintals in the ſpace of 24 hours. The pulveriſed matter is put into heaps in the open air, and ſalt is mixed with it in the proportion of 5 to 50 quintals of the ore, in order to macerate and cleanſe it of its impurities, that the quickſilver may the more readily amalgamate with the metal. Upon theſe heaps, and while they are ſtirring, the quickſilver is preſſed through a cloth. Before the invention of fire-places, the ore was repeatedly kneaded with quickſilver in wooden troughs, and formed into large round maſſes, which were left in that form for two days; after which they were worked again, until the metals appeared to be embodied together, which took from 9 to 20 days; but it was afterwards found that heat aſſiſted the operation ſo far, that by means of proper ovens the ſame might be accompliſhed in five or ſix days. When the quickſilver has taken up the ſilver, and wholly ſeparated it from its matrix the lead and the copper, the ovens are opened, the matter is taken out, and the quickſilver expelled and recovered in the following manner. The mixture is put into water troughs, and ſtirred therein by means of mills and water-wheels, by which the earthy and extraneous particles are waſhed away, and the amalgam ſettles at the bottom. The ſediment looks like ſand. It is further waſhed over in flat plates, and perfectly cleanſed; what goes off with the water is collected for further uſe under the name of *relaves*. When the amalgam is become clean and bright by this method, it is put into a cloth and ſqueezed out. This uncombined quickſilver runs off, and the remaining body of amalgam contains five parts of quickſilver and one of ſolid metal. It is made into maſſes named *pinnas*, having the form of a ſugar loaf, hollow within, and weighing about 100 pounds. They are expoſed to a ſtrong fire in order to expel the quickſilver, after being put into pots covered with earthen heads. The ſilver ſtill appears in the form of amalgam, but is reduced to one ſixth of the former weight. Its texture is ſpongy, and the quality of the metal ſo fine, that the ſilverſmiths cannot work it, neither can it be formed into coin, without an alloy. Baron Born obſerves, however, that it is only cold amalgamation which produces ſilver of ſuch uncommon fineneſs; by hot amalgamation it is generally alloyed with copper, which cannot be parted from it without cupellation.

The moſt circumſtantial account of the amalgamation of ſilver ore is that of Alonzo Barba. He divides the ores into two claſſes: 1. thoſe which are beſt treated by fire and fuſion; and, 2. ſuch as are moſt fit for amalgamation. Thoſe called *pacos* and *tacana*, may be amalgamated; but that none of their richer contents may be loſt, it will be beſt to combine them with lead, and proceed by cupellation. The former of theſe ores has no luſtre or brightneſs. It is ſaid to be of a reddiſh yellow, ſoft and friable; ſeldom rich in ſilver, and moſtly valuable on account of its being eaſily got from the mine. Tacana is a rich ſilver ore, of a black colour, ſometimes of a grey or of an aſh-colour; or a brown, rich, ſilvery earth. 3. The *plomo* is too rich for pulveriſation and amalgamation, and is therefore ſimply melted down with the tacana. This ſeems to be the ſame with the horn-ſilver ore; and is deſcribed as almoſt entirely conſiſting of native ſilver, of a black, grey, or greeniſh-white colour. Barba ſays that they found at Potoſi ſome plomo of a cinnabar colour, which they had not ſeen any where elſe; but Baron Born thinks that here he has miſtaken the red ſilver ore for another ſpecies. Frezier aſſerts, that in what he calls the *plomo ronco*, the native ſilver appears upon rubbing or ſcratching it, and that it gives white and very pure ſilver by ſimple fuſion without any amalgamation. In the imperial cabinet at Vienna, there is a ſpecimen weighing about a pound, of black horn ſilver ore from Potoſi, on the poliſhed ſurface of which the virgin ſilver appears very plainly. 4. The *machacado* (virgin ſilver or gold grown in the matrix in the form of wire or hair), is amalgamated in the mortar. 5. The *ſoroches* (lead ores containing ſilver), are melted along with the *roſicler* and *conchiſo*, two kinds of red ſilver ore. 6. The *negrillos* (grey copper and white ſilver ores) may be refined by amalgamation, though they are more fit for fire.

Beſides this claſſification in ſuch as are fit for fire, and thoſe for amalgamation, the ores require further to be ſorted into ſuch as require the addition of particular ſubſtances for their amalgamation. Vitriol is generally hurtful, eſpecially when ſalt is added to the vitriolic ores; and it requires the addition of iron, tin, lead, and lime, in order to counteract its effects; but in ſome caſes it is of ſervice, and promotes amalgamation. The calcination of vitriolic ores is of no ſervice, but rather the contrary, as it diſengages the vitriol, and brings on a vitriolic efflореſcence. It may, however, be ſeparated by waſhing till the water comes off taſteleſs and ſweet. The amalgamation is diſturbed by ſulphur, bitumen, and antimony, only by the ſmoothneſs and needle-like figure of the particles, which reduce the quickſilver to a kind of duſt. The ores mixed with theſe always run into reguli, and muſt therefore be put into a ſtrong calcining fire; if melted without calcination, they would run entirely into droſs and ſcoria.

Amalgamation of Silver and Gold Ores.

The finer the ores are pounded ſo much the better; and after putting the powder thro' a fine ſieve, the coarſer part goes again to the mill: they ought to be previouſly burnt, in order to aſſiſt the operation of grinding. The beſt method of obtaining fine powder is by waſhing over; but as this is very apt to pack and turn clammy, it ought to be mixed with ſand.

The ores are known to be ſufficiently calcined by their change of colour and loſs of brightneſs. Barba tells us, that all bright ores muſt be calcined, but with great care, that no vitriol may be diſengaged, as that proves injurious to the amalgamation; but baron Born ſays, that one of the greateſt objects in the calcination of the Hungarian ores is to decompoſe the ſulphur into vitriol, as promoting the decompoſition of the ſalt. The amalgamation is likewiſe promoted by burning and calcination, in as far as it promotes the pulverization of the ore, and aſſiſts the action of the quickſilver; but it is chiefly uſeful in the black and grey ſilver ores. It can only be determined by circumſtances whether it be better to pulverize the ores before or after calcination. Their value is beſt known by pounding them previous to calcination. The ſtuff muſt be conſtantly ſtirred during the time it is calcining, and ſome powder taken from the maſs to be tried with quickſilver and ſalt. The thickening of the quickſilver, and the grain of the ſtuff, ſhow what additions are neceſſary, or whether calcination be completed or not. When ores are calcined in lumps, the fire does not act equally upon all their parts; though this method is attended with the advantage of loſing much leſs duſt, as well as ſaving the expence of ſtamps and mills.

Ores cannot be calcined in reverberatory furnaces, as the heat would run it together, and part of the metals themſelves would be carried off by the ſtrong current of air and the violent ſmoke. Barba recommends a furnace of an oblong ſquare figure, with three vaults over each other; the fire is put in the lowermoſt, and the ore into the two upper ones. The heat circulates by means of lateral openings in the walls, and is let out on the back without a flue. The heat is graduated by regiſters and dampers on the outſide.—Whatever kind of furnace, however, is uſed, ſome of the ore will have clotted, and muſt therefore be ground to a fine powder; but to prevent as much as poſſible theſe inconveniences, the hard ores ought to be calcined before they go to the mill, and the ſoft ones after, but with proper additions. The irony ores, which reſiſt the fire longer, are calcined with an addition of ſulphur, or of ſulphureous and antimonial matter, proportioned to the iron they contain; but ſulphureous and antimonial ores require to be calcined with the ſcoria of iron. Arſenical ores, or thoſe mixed with orpiment and ſandarac, are calcined with lead glance; and thoſe mixed with white or black bitumen, muſt be calcined with iron ſcoria or pounded limeſtone.

Amalgamation of Gold and Silver Ores

The impurities of ores, and the additions proper to be made to them, are determined by pounding them coarſely, and throwing them upon a heated plate of iron. If the ſmoke be white or black, it ſhows a mixture of bitumen of theſe colours; if yellow, it ſhows orpiment; if red, ſandarac; if greeniſh-yellow, ſulphur.

Salt ought not to be uſed in the calcination of ores as it would calcine the ſilver; and the duration of the calcining muſt be determined by the change of colour which the ores undergo by calcination by themſelves, and the brightneſs they aſſume by trituration with quickſilver. It is alſo a mark of ſufficient calcination when antimonial and ſulphureous ores no longer ſend out a diſagreeable ſmoke; if the thick and black ſmoke of bituminous ores become white; and if the ſilver in the ſtuff appears in white glittering ſparks. Vitriolic ores may alſo be calcined in the ſame manner; but they require a longer time with the addition of alum and ſalt: they, however, require no farther addition in the ſubſequent operations; and in the courſe of four days all their ſilver will be taken up by the quickſilver. Leſs quickſilver will alſo be loſt; for as there is no occaſion for the frequent turning and working of the heap, a very ſmall part of it only can be turned into uſeleſs duſt. Vitriolic ores ought always to be well waſhed with water before they are calcined; and if there is ſtill a ſuſpicion of their being vitriolic, they muſt be tried by quickſilver: if it takes a lead-colour, the ſtuff muſt be waſhed till iron put into it no longer takes a copper colour. The lixivium is kept as an uſeful addition to ſome ores.

Amalgamation, according to Alonſo Barba's method, is performed in three ways, viz. in heaps or caxons, in the boiler, and in mortars.

1. *In heaps.* Before the operation takes place in the large way, an eſſay is made of three or four pounds of the fine ſifted powder taken from the general quantity; and according to the produce of this he calculates that of the whole. He tries it alſo with quickſilver, to know perfectly the method he is to follow, and the additions that are to be made. In this eſſay the followed method is adopted: 1. The matter is elixated, to extract the vitriol if there be any. 2. One pound of the lixiviated matter is tried with quickſilver and ſalt, carefully obſerving the colour and its change. If the quickſilver aſſumes the appearance of ſilver filings, and theſe quickſilver flakes become thinner and thinner, it proves that the amalgamation goes on ſucceſsfully, and that there is no occaſion for any addition. The whole is ſtirred from time to time, till the quickſilver ſeems to diminiſh, and recover its natural form, but without dividing into ſmall globules; after which the matter is to be waſhed, as all the ſilver is by that time completely taken up. The ores of *Verenguela de Pacages* are treated only with quickſilver and ſalt, and yield their full produce.

When the ore turns black, iron is added; when of a light lead-colour, tin; if a dark lead-colour, lead; and if of a yellowiſh or gold-colour, lime. The three firſt of theſe are ſtyled, by Baron Born, "very idle and uſeleſs additions."—The ore frequently divides into ſmall and powdery globules, in conſequence of the hardneſs of the minerals, or from too much ſtirring; but this may be prevented by calcination before it is reduced to powder, or by leſs ſtirring. In a great many operations, however, this quickſilver duſt can ſcarcely be avoided. It ſerves the workmen as an index of the progreſs they have made, or ſometimes as a direction how to operate; and has different names according to the cauſe by which it is produced; as quickſilver duſt, the duſt of addition, and ſilver duſt. The firſt of theſe ariſes ſimply from too great diviſion, and is white without any quickneſs, ſcarcely moving when the matter is ſtirred with water; it ſticks ſomewhat to the bottom, and runs into globules when broken between the fingers. The ſecond is produced by the amalgam of lead and tin; and, when preſſed between the fingers, unites with the quickſilver which had begun to combine with the ſilver. The third comes from the amalgam of ſilver: it ſinks toward the coarſer ſtuff on the bottom, and floats about in flakes of different ſizes; turning into an amalgam when rubbed or preſſed between the fingers. All of theſe are produced chiefly when there are lead, marcaſite, and irony ores in the mixture; or by vitriol of copper, which is particularly productive of this minute diviſion of the quickſilver. They are produced alſo by too plentiful an addition of ſalt, which thickens the water and prevents the deſcent of the particles of quickſilver.

According to the produce of the eſſay the large heap is regulated. It is firſt wetted with water, and mixed with a due proportion of ſalt; but at the beginning only one third of the quickſilver and one half of the lead and tin are added. It is turned over once every day during the two firſt days, becauſe the quickſilver being then uncombined would be apt to be driven off in ſmall globules, and a great waſte occaſioned. The heap is likewiſe too much cooled by the addition of too much quickſilver at once; ſo that it is better to put it gradually to the other matters. The lead and tin are always thrown into the heap along with the quickſilver; but too much of either is hurtful, by deadening the quickſilver, and preventing the amalgamation. All theſe additions, however, muſt vary according to circumſtances; obſerving that the quantities added muſt always be leſs and leſs in proportion as the amalgam advances to perfection. The matter ſhould be kept rather dry than otherwiſe, and two parts of amalgam be in the heap to one of fluid quickſilver. Too great an abundance of this fluid maſs is very detrimental, on account of the quantity of quickſilver duſt which it occaſions; and if the other ingredients are accidentally waſted, the *duſt of addition* will be changed into *quickſilver duſt;* which having very little weight, will be poured off along with the water. But when lime is added, the whole muſt be mixed at once, and the entire heap turned over two or three days, till the quickſilver be added. Too much lime prevents the union of the two metals, and is an inconvenience which cannot be remedied.

The heaps are frequently turned and worked over after the firſt two days, which is attended with ſeveral advantages; as that the quickſilver is thus heated; more thoroughly mixed with the matter, and the ſilver is purified by the frequent rubbing. The heaps, however, are ſubject to various accidents, owing to the difference between the various kinds of ores, which cannot always be exactly known. When the quickſilver is deadened by too large an addition of lead, iron, tin, or lime, it loſes its oval form, and aſſumes a vermicular one: if ſhaken in a glaſs, or other veſſel, without water, it adheres to the ſides in threads, and is unfit for taking up the ſilver. The beſt remedy is vitriol of copper, or the lixivium of vitriolic ores already mentioned; or powder of copper may be thrown into the heap. All additions of this kind, however, muſt be made very cautiouſly, and in conſequence of experiments made by ſmall eſſays, which determine the quantity of materials to be uſed. When the heaps have too much vitriol, without any correcting ingredient, the quickſilver has a leaden colour, and the ſmaller particles aſſume a ſpherical form. Iron might be added to abſorb the too great quantity of vitriolic acid; but there is no certain rule for the proportion to be added, ſo that it muſt be determined by experiment.

When the quickſilver appears, on turning the heaps like a bunch of grapes, this ſhows an exceſs of ſalt, which prevents the quickſilver from combining with the ſilver: it is to be remedied by the addition of ſome coarſe ſtuff which cleanſes the fluid. Some add aſhes: but the beſt and moſt natural remedy is alum, which is found at Potoſi in abundance, and whitens the ſilver. If the heap be not turned equally, or the quickſilver added at a proper time, or if the ſilver do not unite with it, ſome of the ſilver will appear in a dry form and lie on the coarſer ſtuff like a cobweb; and if not ſkimmed off in time will be carried away by the waſhing water. To collect this dry ſilver, and the fineſt quickſilver duſt, ſome ſilver amalgama is preſſed upon it through a chamois ſkin; and the whole is once more turned and worked over. The frequent turning, the heat of the climate and ſeaſon, as well as the fermentation produced in the heap by the vitriol and other additions, all promote the amalgamation; but cold, neglect of ſtirring, and the quickſilver aſſuming a lead colour, are againſt it. It is, however, very difficult to determine the maturity of the heap, when all the ſilver is taken up, and the matter may go to the waſhing; though great inconveniences attend an ignorance in this reſpect. If waſhed too ſoon, ſome ſilver is left in the leavings: and if worked too long there is a loſs of quickſilver as well as time and labour. The difficulties attending the knowledge of this important point, are by our author enumerated as follow: " The heap may appear not to require any additional quickſilver; the ſilver duſt may appear to be completely collected; that of quickſilver may begin to make its appearance: the amalgama may begin to appear pure, and to ſhow a gold-colour: and yet ſilver may remain in the leavings. The moſt infallible teſt of the maturity of the heap, is the eſſay of the triturated ſtuff by fire. If no ſilver is produced thereby, then ſo much quickſilver is thrown into the heap, that it may contain three parts of amalgama to two of ſilver, or at leaſt one part of quickſilver to two of amalgama. By this additional freſh quickſilver, all the duſt of quickſilver, and the dry and uncombined quickſilver, are perfectly collected the amalgama is the heavier for it, and ſinks the more readily to the bottom when brought to the waſhing-tub.—Some clean quickſilver is alſo put into the bottom of this tub: the inſide of which muſt be lined with iron plate well cleaned, and rubbed with quickſilver;" (though the laſt operation ſeems to be quite ſuperfluous, as mercury will not in the leaſt unite with iron by rubbing). " The ſtuff brought into the tub muſt be diluted with a great quantity of water, and be ſtirred round with a peſtle lined with iron-plate in ſuch a manner that it may turn round ſix times one way and ſix times the other, always touching the bottom; the unconnected bodies of quickſilver and amalgam are thereby to meet, to combine, and to fall to the bottom. To recover the ſalt which had been mixed with the heap, the water muſt be evaporated:" but the Baron obſerves, that at Shemnitz no ſalt is recoverable from the lixivium; and if any be recovered by the Spaniards, it only ſhows that they add too much, and that part of the remainder is undecompoſed by the vitriolic acid. The quickſilver is ſeparated from the amalgama much in the ſame way as already deſcribed.

2. *Amalgamation by boiling*, was accidentally diſcovered by Barba, in an attempt to fix quickſilver.—On mixing ſilver ore finely powdered with quickſilver, and boiling it with water in a copper veſſel, he found that the metals readily united; and thus having diſcovered a ſhorter method of amalgamation, he gradually improved and introduced it into practice in Peru. In this operation the boilers muſt be of copper, earthen or other veſſels being found not to anſwer: the copper alſo muſt be pure, becauſe the quickſilver would diſſolve the metals with which it is alloyed. They muſt be in the ſhape of inverted cones and flat-bottomed. The under part has a rim of ſix or eight inches high and half an inch broad, all beat of one piece. Other copper plates are fixed in the inſide with copper nails; and care muſt be taken that it be water-tight, that no quickſilver may run off; and for the better ſecurity, the inſide of the boiler may be lined with lime and ox-blood. The boilers may be of any magnitude; their upper parts being ſurrounded with iron rings with ſtrong handles, into which a croſs board is wedged. In the middle of this board is a hole for the ſpindle to move in. The ſpindle is of light wood, and moves on a braſs pivot in the bottom. It has four wooden wings, with three or four perpendicular bars alſo of wood; the fartheſt from the ſpindle being the ſhorteſt; the nigheſt ſo long as to ſweep the bottom. It is turned by a moveable handle on the upper end.

Theſe boilers are put into an oblong furnace, capable of holding 10 of them; the fire-place being in the middle, and the flame and ſmoke paſſing under the boilers, and going out on both ends of the furnace by two chimnies. The fire being lighted, firſt the water, then the fine ſtuff, and at laſt the quickſilver, is put in; obſerving always that the bottom be fully covered with quickſilver. The water muſt always be kept boiling, otherwiſe the operation may be interrupted or become tedious: on account of the evaporation, the boilers muſt be ſupplied with a quantity of water, in ſmall quantities at a time, that the boiling be not checked. The ſtuff muſt be proportioned to the ſize of the boiler: if too little be put in, the amalgamation goes on too ſlowly; while too much would

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not allow the maſs to be thick enough, or to boil with ſufficient freedom. Some of the amalgam is to be taken out from time to time with a long ladle, and the progreſs of the operation is judged of by the colour. The eſſay of the ſtuff determines whether all the ſilver be taken out of it in this manner. Some quickſilver is then thrown upon the ſurface of a ſample of the boiled ſtuff, and worked round with it in a veſſel two or three times. If the quickſilver riſes and takes up ſome of the ſtuff, ſome ſilver remains; if not the whole is taken up. Then the fire is ſtopped, the ſpindle is taken out, and the water and ſtuff let off. The coarſer matter on the quickſilver may at all events be waſhed in cold water, and go once more to the mill. Almoſt the whole of the ſilver amalgama lies upon the ſurface of the quickſilver, immediately under the ſtuff, ſometimes four or five fingers thick; the fire under the boilers preventing the ſilver from uniting with the quickſilver in the bottom. This metal, when poured off, muſt be preſſed and treated in the uſual manner.

The advantages attending this method are, that the heat promotes the union of the metals, while the boiling of the water and ſtirring of the mixture with the ſpindle bring them more frequently in contact with each other in a quarter of an hour, than they would be in ſeveral days in the common method; by which means the whole proceſs is finiſhed in about 24 hours. Leſs quickſilver is alſo loſt by it; for being always covered with water, it cannot evaporate; and in well managed and ſucceſsful operations, no quickſilver duſt is produced: but the greateſt recommendation is, that it is not attended with any loſs of ſilver, ſo that even the pooreſt ores will yield all that they contain. Barba looks upon the profit of this method above the other to amount to 25 dollars for every heap of 50 quintals; even making allowance for the coals. The only objections are, that both ſilver and copper are apt to be loſt by the corroſion of the copper-boilers: but if the copper be pure, there is no great reaſon to be apprehenſive of any thing of this kind; or, at all events, the bottom of the boiler, which is conſtantly expoſed to the action of the quickſilver, may be ſecured by a copper ring three or four inches high; and the bottom itſelf may be ſecured in the ſame manner; ſo that when corroded they may be changed for new ones: or the boilers may be paved or lined with varniſhes or mortars of different kinds; which will as effectually prevent any loſs. While the whole is boiling, the quickſilver violently ſeizes on the other metal; by which means the amalgam is filled with many heterogeneous particles. Theſe are ſeparated by waſhing in quickſilver, on the ſurface of which they ſwim like ſcoria, and may eaſily be taken off, till the quickſilver ſhows its uſual brightneſs and as this cannot be done without taking off ſome of the metals alſo, the ſcum may be reſerved for the next operation. The advantage of amalgamation by boiling chiefly appears in this, that heaps, in which by too large additions, the quickſilver has been totally diſſolved ſo as to diſappear, may be eaſily cured by boiling them, in iron or copper veſſels with bits of iron; for then the quickſilver appears again in its proper metallic form and brightneſs.

3. *Amalgamation in mortars.* It is difficult to procure the full produce from ores which contain native gold and ſilver either in the form of hair or wire, or in larger lumps and nodules. Theſe cannot be completely pounded, nor can they be amalgamated; for the mercury will not diſſolve the large particles of gold and ſilver; and when they are treated by fire, the ſtubborn nature of their matrices occaſions a great loſs of metal. The following method of treating them in a mortar was diſcovered by a Franciſcan friar.

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A round conical hole is cut in a hard ſtone, half a foot in diameter at top, of an equal depth, and ſloping into a truncated, or rather obtuſe and nearly flat bottom, of about four inches in diameter. Some quickſilver is poured into it, together with a proportional quantity of ſmall bits of the native metal or ore; after which they are triturated with an iron peſtle. By this violent trituration, the gold and ſilver combine with the quickſilver; and the finer, lighter ſtuff of red ſilver ore and other ſilver calces, which are generally found with native ſilver, runs off by means of a ſmall launder and current of water. It is not, however, ſuffered to run away, but is left to ſettle for common amalgamation.

Mortars of the dimenſions above deſcribed being too ſmall for any conſiderable quantity of ore, Barba propoſes to ſubſtitute in their place larger ſtones of a concave figure, with vertical grinders, as in oil-mills; or common horizontal and parallel grinders of the griſt-mill. The ore and quickſilver are put between theſe ſtones, with a ſmall ſtream of water; which, running off, will carry away the lighter ſtuff, whilſt the gold and ſilver will remain at the bottom, taken up by the quickſilver.

There are ſeveral other methods of amalgamation deſcribed in Baron Born's work, as practiſed by the Spaniards of South America: but as all of them agree in the moſt material circumſtances with thoſe already mentioned, we ſhall only farther take notice of that invented by the Baron himſelf, and by him lately introduced at Shemnitz in Lower Hungary.

This method is very pompuouſly related, and at great length, in his work on the ſubject. His theory contains the following particulars:

1. Quickſilver has a tendency to unite with other metals and ſemimetals, and to *quicken* or *animate* them according to certain laws of affinity which are determined by experience.

2. It unites with gold, ſilver, copper, tin, lead, biſmuth, and zinc, without heat; but with other metals and ſemimetals it will not unite but in a ſtate of fuſion. It unites with tin and biſmuth more eaſily than with gold and ſilver; and with theſe more readily than with copper.

3. The union of quickſilver with other metals is promoted by heat.

4. This union is alſo greatly promoted by mechanical comminution.

5. No amalgamation, or only a very ſlow and partial one will take place, if the ſurface of the quickſilver or metallic particles be covered with a coat of heterogeneous matter; which happens chiefly in the amalgamation of ores where the fine particles of the metal are involved in ſulphur and arſenic.

6. Hence it is neceſſary to free the noble metals

from the ſtony matter which ſurrounds them, and to reduce the baſer ones from their calciform to a metallic ſtate, before they can be amalgamated with ſucceſs.

7. Particles of gold and ſilver may be freed from the ſtony matters which involve them by trituration; and from ſulphur and arſenic, by calcination.

8. In calcination, ſome part of the ſulphur is deſtroyed, and vitriolic acid diſengaged; which, combining with the earthy matters contained in the ore, as well as the calces of the baſer metals mixed with it, ſtill leave the gold and ſilver involved: whence it is neceſſary to employ ſuch chemical agents as will free the particles of theſe metals from their heterogeneous coat, and keep their ſurface as well as that of the quickſilver clean, without acting either upon the gold or ſilver. Theſe agents are principally the mineral acids, which act variouſly according to their different natures. The marine acid is moſt efficacious for gold or ſilver ores; but it would be exceedingly expenſive to uſe it in its proper form, ſo that it is neceſſary to take ſome method of expelling it extemporaneouſly from common ſalt by means of oil of vitriol.

9. The calcined ore, when pulveriſed, muſt be wetted with water, for the purpoſe of diſſolving the diſengaged vitriolic acid and the earthy and metallic neutral ſalts, which are produced by it in proportion to the ſulphur contained in the ore. Vitriol is produced by calcination only in this proportion; and hence if the ore does not naturally contain a ſufficiency of ſulphur to produce vitriol for the purpoſe of decompoſition, it will be neceſſary to add ſomething of this kind. Vitriol of copper or of iron will anſwer, but the former is preferable. If, therefore, the pulveriſed ore, which has once gone through the proceſs of amalgamation, ſhould ſtill appear to contain gold or ſilver, mix it with ſome additional vitriol and common ſalt; leave it for ſome time to macerate by itſelf; and, at a ſecond trituration with quickſilver, a conſiderable quantity of ſilver will be found in the amalgama which had not been extracted in the firſt, though common ſalt had been uſed in it. Thus the common ſalt may be decompoſed in the wet way.

10. To decompoſe the common ſalt in the dry way, the ore muſt be properly ſtamped and ſifted, and the mixtures made up with a proportional quantity of pulveriſed common or rock ſalt, and then undergo an adequate calcination in an open fire. Thus the common ſalt will be decompoſed according to the nature of the mixture; either by the vitriolic acid produced by the decompoſition of the ſulphur, or otherwiſe.—The muriatic acid, thus diſengaged, diſſolves the heterrogeneous particles in which the metals are involved, and allows the quickſilver to act upon them much more effectually than it could have been enabled to do by any mechanical comminution; and this the more ſo as it takes up even thoſe particles of dephlogiſticated iron upon which the other acids are incapable of acting.

11. The calcination and corroſion of the baſer metals is indiſpenſably neceſſary, eſpecially in a natural combination of gold and copper; for the affinity of theſe two is ſo ſtrong, that unleſs the latter be perfectly calcined, or otherwiſe removed, very little of the gold can be extracted. The ſeparation will alſo be promoted by the addition of ſulphureous ſubſtances.

From theſe conſiderations, the Baron lays down the following rules concerning amalgamation.

"1. The ores and mixtures previous to their amalgamation muſt be mechanically comminuted, and reduced to a fine powder, by ſtamping, grinding, and ſifting, that the ſurfaces of the particles, and their points of contact, may be increaſed and multiplied.

"2. This powder muſt be calcined, that, beſides the pure particles of the nobler metals, thoſe which are diſguiſed in the ore may be diſengaged and laid bare by deſulphuration and calcination.

"3. If before its calcination no common ſalt was added, it muſt be added afterwards; then it muſt be triturated with a proportionate quantity of quickſilver and water, long enough, and in ſuch a manner, that the quickſilver, by an unterrupted motion of the whole maſs, may come into repeated contact with the diſengaged gold and ſilver particles, and take them up.

"4. As much depends on the juſt-mentioned proportions, the inſpector, director, or maſter of the work, muſt be well acquainted with the elective attraction of bodies, that forming a juſt idea *of*, and judgment *on*, their different mechanical or chemical decompoſition and combination, he may remedy and remove ſuch untoward difficulties and impediments in the proceſs as may, and will ſometimes, prevent its full ſucceſs."

The various ſteps by which the metals are extracted from their ores, according to the Baron's method, are, 1. Stamping, grinding, and ſifting. 2. Calcination; after which the grinding and ſifting muſt be repeated. 3. Trituration. 4. Waſhing of the reſiduum. 5. Eliquation of the amalgama. 6. Heating of the ſame. 7. Diſtillation of the quickſilver preſſed from the amalgam. 8. Refining of the heated amalgam. 9. Extracting from the reſidua ſuch parts of the noble metals as may ſtill be contained in them.

1. *Stamping, grinding*, and *ſifting*. The Baron recommends dry ſtamps and mills for this purpoſe; as wet-ſtamps, he ſays, "would bring on great loſs of ſilver and expenſive contrivances to prevent or recover it." On the other hand, E. Raſpe, the tranſlator of his work, ſays, that "late experiments have proved ſo much in favour of the wet ſtamps, that they have actually been adopted as great improvements."

The contents of the ores are accurately inveſtigated by eſſays before any thing is done in the large way. The ores are delivered to the reſpective mills; the ſmaller ores are paſſed over a braſs ſieve, the meſhes of which are about one-tenth of an inch wide, that the finer particles may be ſeparated and not ſent to the ſtamps, which would occaſion ſome waſte, eſpecially in the dry way. The finer ſand is ſent directly to the mill, and the big lumps to the ſtamp. Each box, or ſet of ſtamps, has three ſtamp-heads, weighing 40 or 54 pounds, the ſole being of caſt-iron. The matter is every now and then wetted with water to prevent the finer parts from flying off. When the ore is ſufficiently beat in the ſtamps, it is afterwards ſifted, and the coarſe part returned to the ſtamp. When the coarſeſt part is reduced in this manner to the ſize of coarſe ſand, it is ſent to the mill; the running ſtone of which

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which muſt be kept cloſe in a box, and nothing left open but the admiſſion-funnel. The millſtones are a kind of porphyry, and the ſieves of braſs-wire.

2. *Calcination.* The ore being reduced to a ſufficient degree of fineneſs, is next carried to the calcining furnace; previous to which it is again to be tried by eſſay, and to have the proper additions according to its nature. When the furnace is properly heated, the whole quantity of ore deſtined to one furnace, about 30 quintals, is brought up to the top by wheel-barrows; and being ſpread as even as may be, the proper quantity of ſalt and lime is ſifted over it; and the whole turned with crooks and rakes till it be perfectly mixed. The calcination is then performed in the following manner: The back-door being carefully ſhut, eight hundred weight of the matter, prepared as already mentioned, is let down through a funnel upon the upper hearth. Here is again to be ſpread and allowed to dry before it is put down on the lower hearth; and as ſoon as this is done, another quantity is put upon the upper hearth, that the two operations may regularly ſucceed each other.

Our author deſcribes at great length all the minutiæ of this operation: but, as he juſtly obſerves, "Experience and practice are, and muſt be, the beſt teachers; for there are many things which muſt be attended to, and which words and deſcriptions will hardly make intelligible." We ſhall therefore only obſerve, that the calcining furnace muſt be kept heated day and night: but while the ore is ſhoved down from the upper to the lower hearth, the fire muſt be kept very moderate; and during the calcination it will be neceſſary to keep the matter conſtantly turning with iron rakes, the combs or teeth of which are from four to eight inches long.

The grinding and ſifting after calcination is only neceſſary when the matter has run into hard indiſſoluble clots during the operation; and is performed in a grinding and ſifting mill, which turns by water; but which is unneceſſary here to deſcribe, as every poſſeſſor of mines would chooſe ſuch mechanical contrivances as beſt ſuit his purpoſe.

3. *Trituration, boiling,* and *amalgamation.* After the ores have been properly calcined and pounded, the ſucceſs of the amalgamation depends moſtly on the proportions of quickſilver and water which are added to the ſtuff, and the conſtruction of the ſtirring apparatus by which the whole is kept in conſtant motion and mutual contact. The lighter the ſtuff, the more voluminous and bulky it will prove, and conſequently the gold and ſilver will be more diſperſed; in which caſe the quantity of quickſilver muſt be proportioned to the maſs, that notwithſtanding its conſtant gravitation towards the bottom it may the more frequently come in contact with the gold and ſilver. It acts in proportion to its bulk and ſurface. A larger quantity is therefore adviſable, as it not only forms a larger ſurface on the bottom of the veſſel, but comes likewiſe into contact with the gold and ſilver more frequently; nor is there any greater loſs of quickſilver to be apprehended on that account. A larger proportion of fluid metal is in particular neceſſary when the matter it mixed with lead or antimony: for, by taking up the lead, it becomes proportionably leſs active and fit for the reception of gold and ſilver; and turning greaſy by the antimony, it muſt in the former caſe leave rich reſidua, and in the latter bring on greater loſs. It is alſo determined by experience, that the exceſs of quickſilver never does any hurt, while too ſmall a quantity never fails to be diſadvantageous.

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With regard to the conſtruction of the boilers, it is needleſs to be particular, as thoſe recommended by Alonſo Barba ſeem to be very adequate to the purpoſe. Heat is required; but it is not neceſſary that the matter ſhould boil, a moderate fire being ſufficient for making the metals unite. Nor is there occaſion for more water than what will make the matter liquid. The ſtirring apparatus is put in motion by the crank of a water wheel, and a horizontal rack with cogs; which, being properly fixed in a groove by croſs bars, ſlides forward and backward on braſs rollers and caſters. The cogs of this rack catch into thoſe of the perpendicular trundle and ſpindle of the ſtirrers, which turns round twice by three and an half feet motion of the ſliding rack. The whole moves quicker or ſlower in proportion to the box of water thrown upon the wheel; and the quicker motion of the rack produces of courſe a quick turn and better trituration. The ſtirrers muſt be circular ſegments correſponding with the ſides and bottom of the boiler, otherwiſe their motion is irregular and unſatisfactory. The time of trituration, as depending on the nature of the ore, muſt be determined by experience.

4. *The waſhing of the triturated leavings or reſiduum* is performed in large tubs, and requires no particular deſcription, farther than that it be continued till all the ſoluble matter be got out; and for this purpoſe there muſt be a contrivance for ſtirring the matter all the time it is waſhing.

5. *Eliquation of the quickſilver and amalgama.* Formerly this was performed in bags made of deer-ſkins, ſtrongly compreſſed with engines for the purpoſe; but this being found too expenſive, it is now done by ſmall quantities at a time, and preſſed only by the hand till the ball of amalgam yields no more quickſiver. A ſmall quantity always remains in the quickſilver which paſſes through; and this quantity is the greater in proportion to the warmth of the amalgam when preſſed.

6. The *diſtillation of the amalgam* is performed *per deſcenſum* in large iron pots. The undermoſt ſtands upright to its middle in a ſtream of cold running water which paſſes under the hearth; the upper part hardly appearing two inches above it. The amalgam, made up into balls, is placed in iron cullenders fixed upon a tripod ſet in the bottom of the lower pot, and covered in the inſide with a coarſe cloth. The upper pot is inverted on the lower one; and the juncture being luted, the fire is put all round the outer one, and the heat paſſing through to the amalgam quickly liquefies it, and raiſes the quickſilver in vapour, which condenſes in the under pot continually kept cool by the ſtream of water. The upper pot is kept in a ſtrong red heat for five or ſix hours; by which means the cloth is entirely converted into tinder, ſo that the cullenders muſt afterwards be cleaned with a braſs bruſh.

The other operations contain nothing particular but what may be eaſily underſtood from what has been already delivered.

Copper Ores.

Sect. IV. *Ores of Copper.*

§ 1. Copper is found under ground in three different forms: 1. Native or virgin copper diverſely ramified, which is much more rare than native ſilver. This native copper is not ſo ductile as copper purified by fuſions from the ore (A). 2. Copper is found in form of calx, of verdegriſe, of precipitates. Such are the minerals called *ſilky copper ores*, and ſeveral white and green earths. Theſe matters are only copper almoſt pure and but little mineraliſed, but which has been corroded, diſſolved, precipitated, calcined by ſaline matters, by the action of the air, of water, and of earths (B). 3. Copper is frequently in a truly mineral ſtate, that is, combined with ſulphur and with arſenic, with other metallic matters mixed with earths, and enveloped in different matrices (C). Theſe are the true copper ores. They have no regular forms except they partake of the nature of pyrites. Their colours are very different, which depend chiefly on the proportion of the mineral ſubſtances compoſing them. Laſtly, in almoſt all of them we may perceive green or blue colours, which always indicate an eroſion or calcination of the copper. Moſt copper ores contain alſo ſome iron or ferruginous earth, to which the ochrey colour is to be attributed, which might make us believe them to be ores of iron. Ores which contain much iron are the moſt difficultly fuſible.

Copper ores have almoſt all a yellow, golden, and ſhining colour, by which they are eaſily diſtinguiſhed. Some of them are coloured with iriſes, and frequently have ſpots of verdigriſe, by which alſo they are diſtinguiſhable from other ores.

Many copper ores are alſo rich in ſilver. Such is that called the *white copper ore*, the colour of which is rather occaſioned by arſenic than by ſilver, although it contains ſo much ſilver as to be enumerated by ſeveral mineralogiſts amongſt ſilver ores.

Laſtly, the pyrites of a golden yellow colour which contains copper and ſulphur, and the white pyrites which contains copper and arſenic, are conſidered as copper ores by ſeveral chemiſts and naturaliſts. Henckel and Cramer remark, that no proper ore of copper is known which does not contain a conſiderable quantity of arſenic.

Eſſaying of Ores of Copper.

§ 2. *Ores of copper* may be *eſſayed* in methods ſimilar to theſe employed for ſmelting of large quantities of ores (Part III.), or they may in general be eſſayed by the following proceſſes.

PROCESS I.

To reduce and precipitate copper from a pure and fuſible ore in a cloſe veſſel.

" Mix one, or, if you have ſmall weights, two docimaſtical centners of ore beat extremely fine, with ſix centners of the black flux; and having put them into a crucible or pot, cover them one inch high with common ſalt, and preſs them down with your finger: but let the capacity of the veſſel be ſuch that it may be only half full; ſhut the veſſel cloſe, put it into the furnace; heap coals upon it, ſo that it may be covered over with them a few inches high; govern the fire in ſuch a manner that it may firſt grow ſlightly red-hot. Soon after you will hear your common ſalt crackle; and then there will be a gentle hiſſing noiſe. So long as this laſts, keep the ſame degree of fire till it is quite over. Then increaſe ſuddenly the fire, either with the funnel and cover put upon the furnace, or with a pair of bellows applied to the hole of the bottom part, that the veſſel may grow very red-hot. Thus you will reduce and precipitate your copper in about a quarter of an hour: then take out the veſſel, and ſtrike with a few blows the pavement upon which you put it, that all the ſmall grains of copper may be collected in one maſs.

" Break the veſſel, when grown cold, in two, from top to bottom, as nearly as you can: if the whole proceſs has been well performed, you will find a ſolid, perfectly yellow and malleable regulus adhering to the bottom of the veſſel, with ſcorias remaining at top of a brown colour, ſolid, hard, and ſhining, from which the regulus muſt be ſeparated with ſeveral gentle blows of a hammer; this done, weigh it, after having wiped off all the filthineſs.

A ſoft, duſty, and very black ſcoria, is a ſign of a fire not ſufficiently ſtrong. Small neat grains of copper,

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(A) *Native copper* is ſolid; or conſiſting of friable maſſes, formed by precipitation of cupreous vitriolic waters called *cement* or *ziment copper*; or forming cryſtallized cubes or grains, leaves, branches, or filaments.

(B) *Calciform ores* are either pure calces of copper, or are mixed with heterogeneous matters. 1. The *pure* or looſe friable ochre, called *cæruleum montanum* " mountain-blue," and *viride montanum* " mountain-green;" and the *red indurated calx*, called improperly *glaſs copper ore*. 2. *Mixed* calciform ores are thoſe in which the calx of copper is mixed; with *calcareous earth*, forming a mountain-blue; with *iron*, forming a black calx; with *gypſum*, an indurated green ore, called *malachites*; and with *quartz*, a red ore.

(C) Copper is *mineraliſed*, 1. By *ſulphur*, forming the *grey copper ore*, improperly called *vitreous* (minera cupri vitrea Wallerii). 2. By *ſulphurated iron*, forming the *hepatic copper ore* (minera cupri hepatica Wallerii) of a brown yellow colour. It is a kind of cupreous pyrites, and is called by Cronſtedt *minera cupri pyritacea*. Sometimes it is of a blackiſh grey colour, and is then called *pyrites cupri griſeus* (minera cupri griſea Wallerii); ſometimes of a reddiſh yellow, and tarniſhed with blue iriſes on its ſurface, when it is called *minera cupri lazurea*; when of a yellowiſh green colour, it is the *pyrites cupri flavo-virideſcens* (cuprum ſulphure et ferro mineraliſatum Wallerii); and when of a pale yellow colour, it is the *pyrites cupri pallidé flavus*. Moſt of the above piritaceous ores contain alſo ſome arſenic, but their ſulphur is predominant. 3. *Copper mineraliſed by ſulphur, iron, and arſenic. White copper ore* (Minera cupri alba Wallerii). This ore contains alſo ſome ſilver. 4. *Copper diſſolved by vitriolic acid. Native blue vitriol.* 5. *Copper united with bitumens. Copper-coal ore.* This is a pit coal, from the aſhes of which copper is obtainable. 6. Copper is alſo found in the mineral called *kupfer nickel.*

Eſſaying of Ores of Copper.

per reduced but not precipitated, and adhering ſtill to ſcorias, eſpecially not very far from the bottom, and an unequal and ramificated regulus, are ſigns of the ſame thing. A ſolid, hard, ſhining, red-coloured ſcoria, eſpecially about the regulus, or even the regulus itſelf when covered with a like ſmall cruſt, are ſigns of an exceſs in the degree and duration of the fire.

“ *Remarks.* All the ores which are eaſily melted in the fire are not the objects of this proceſs; for they muſt alſo be very pure. Such are the vitreous copper ores.” (Mr Cramer means, it is preſumed, the red calciform ore, called improperly *glaſs ore*, and not the *minera cupri vitrea* of Wallerius, which being compoſed of copper mineraliſed by ſulphur could not be treated properly by this proceſs, in which no previous roaſting is required. The ſulphur of this ore would with the alkali of the black flux form a hepar, from which the metal would not precipitate). “ But eſpecially the green and azure-coloured ores, and the *cæruleum* and *viride montanum*, which are not very different from them. But if there is a great quantity of arſenic, ſulphur, or the ore of another metal and ſemimetal joined to the ore of copper, then you will never obtain a malleable regulus of pure copper, tho' ores are not always rendered refractory by the preſence of theſe.”

PROCESS II.

To reduce and precipitate copper out of ores rendered refractory by earth and ſtones that cannot be waſhed off.

“ Beat your ore into a moſt ſubtile powder, of which weigh one or two centners, and mix as much ſandiver to them. This done, add four times as much of the black flux with reſpect to the ore; for by this means, the ſterile terreſtrial parts are better diſpoſed to a ſcorification, and the reducing and precipitating flux may act more freely upon the metallic particles freed from all their incumbrances.

“ As for the reſt, make the apparatus as in laſt proceſs: but you muſt make the fire a little ſtronger for about half an hour together. When the veſſel is grown cold and broken, examine the ſcorias, whether they are as they ought to be. The regulus will be as fine and ductile as the foregoing.

“ *Remarks.* As theſe copper ores hardly conceal any ſulphur and arſenic in them, the roaſting would be of no effect, and much copper would be loſt. For no metallic calx, except thoſe of gold and ſilver, improperly ſo called, can be roaſted, without you find a part of the metal loſt after the reduction.”

PROCESS III.

To precipitate copper out of an ore (D) *that contains iron.*

“ Do all according to laſt proceſs. But you will find after the veſſel is broken, a regulus upon no account ſo fine, but leſs ductile, wherein the genuine colour of the copper does not perfectly appear, and which muſt be further purified.

Eſſaying of Ores of Copper.

“ *Remarks.* The fire uſed in this operation is not ſo ſtrong that the iron ſhould turn to a regulus. But as copper is the menſtruum of iron, which is of itſelf very refractory in the fire; for this reaſon, while the ore and the flux are moſt intimately mixed and confounded by trituration, the greateſt part of the iron being diſſolved by the copper, turns into a regulus along with it.”

PROCESS IV.

The roaſting of a pyritoſe, ſulphureous, arſenical, ſemimetallic, copper ore.

“ Break two docimaſtical centners of the ore to a coarſe powder, put them into a teſt covered with a tile, and place them under the muffle of a docimaſtical furnace. But the fire muſt be ſo gentle, that the muffle may be but faintly red-hot. When the ore has decrepitated, open the teſt and continue the fire for a few minutes; then increaſe it by degrees, that you may ſee the ore perpetually ſmoking a little: in the mean time, it is alſo proper now and then to ſtir it up with an iron hook. The ſhining particles will aſſume a dark red or blackiſh colour. This done, take out the teſt, that it may grow cold. If the ſmall grains are not melted, nor ſtrongly adherent to each other, hitherto all will be well; but if they run again into one ſingle cake, the proceſs muſt be made again with another portion of the ore, in a more gentle fire.

“ When the ore is grown cold, beat it to a powder ſomewhat finer, and roaſt it by the ſame method as before; then take it out, and if the powder is not melted yet beat it again to a moſt ſubtile powder; in this you are to take care that nothing be loſt.

“ Roaſt the powder in a fire ſomewhat ſtronger, but for a few minutes only. If you do not then find the ore any way inclined to melt, add a little tallow and burn it away under the muffle, and do the ſame another time again, till, the fire being very bright, you no longer perceive any ſulphureous, arſenical, unpleaſant ſmell, or any ſmoke; and there remains nothing but a thin, ſoft powder, of a dark red, or blackiſh colour.

“ *Remarks.* Every pyrites contains iron, with an unmetallic earth; to which ſulphur or arſenic, and moſt commonly both, always join. Beſides, there is copper in many pyrites; but ſometimes more and ſometimes leſs: ſome of them are altogether deſtitute of copper; therefore, ſo much as pyrites differ with regard to the proportion of their conſtituent particles ſo much do they differ as to their diſpoſition in the fire. For inſtance, the more copper there is in pyrites, the more it inclines to colliquation. The more ſulphur and arſenic it has in it, the more quickly the melting of it will be procured, and the reverſe: the more iron and unmetallic earth it contains, the more it proves refractory in the fire. Now if ſuch pyrites melt in the roaſting, as happens to ſome of them if they grow but red-hot, the ſulphur and arſenic that lies hidden therein are ſo ſtrictly united with the fixed part, that you would in vain attempt to diſſipate them. Nay,

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(D) Mr Cramer ſtill means the calciform ores only, and not the mineraliſed ores of copper.

Nay, in this caſe, when it is reduced again into a powder it requires a much greater time and accuracy in the regimen of the fire to perform the operation. For this reaſon, it is much better to repeat it with new pyrites. But you can roaſt no more than the double quantity at once of the ore you have a mind to employ in the foregoing experiment; to the end that, the precipitation by fuſion not ſucceeding, there may remain ſtill another portion entire; leſt you ſhould be obliged to repeat a tedious roaſting. If you ſee the ſigns of a ferreous refractory pyrites, the operation muſt be performed with a greater fire, and much more quickly. However, take care not to do it with too violent a fire: for a great deal of copper is conſumed not only by the arſenic, but alſo by the ſulphur; and this happens even in veſſels ſhut very cloſe, when the ſulphur is expelled by a fire not quite ſo ſtrong; which a reiterated and milder ſublimation of the ſulphur in a veſſel both very clean and well cloſed will clearly ſhow.

"When the greateſt part of the ſulphur and the arſenic is diſſipated by ſuch cauſes as promote colliquation, you may make a ſtronger fire: but then it is proper to add a little of ſome fat body; for this diſſolves mineral ſulphur: it changes the mixture of it in ſome part, which, for inſtance, conſiſts in a certain proportion of acid and phlogiſton; and at the ſame time hinders the metallic earth from being reduced into copper, by being burnt to an exceſs. From theſe effects, the reaſon is plain why aſſayers produce leſs metal in the trying of veins of copper lead, and tin, than ſkilful ſmelters do in large operations. For the former perform the roaſting under a muffle, with a clear fire, and without any oily reducing menſtruum; whereas the latter perform it in the middle of charcoal or of wood, which perpetually emit a reductive phlogiſton.

"The darker and blacker the powder of the roaſted ore appears, the more copper you may expect from it. But the redder it looks, the leſs copper and the more iron it affords; for roaſted copper diſſolved by ſulphur or the acid of it is very black, and iron, on the contrary, very red.

PROCESS V.

The precipitation of copper out of roaſted ore of the laſt proceſs.

"Divide the roaſted ore into two parts: each of them ſhall go for a centner: add to it the ſame weight of ſandiver, and four times as much of the black flux, and mix them well together. As for the reſt, do all according to the proceſs I: the precipitated regulus will be half malleable, ſometimes quite brittle, now and then pretty much like pure copper in its colour, but ſometimes whitiſh, and even blackiſh. Whence it is moſt commonly called *black copper*, though it is not always of ſo dark a dye.

"It is eaſy to conceive, that there is as great a difference between the ſeveral kinds of that metal called *black copper*, as there is between the pyritoſe and other copper ores accidentally mixed with other metallic and ſemi-metallic bodies. For all the metals, the ores of which are intermixed with the copper ores being reduced, are precipitated together with the copper which is brought about by means of the black flux. Wherefore iron, lead, tin, the reguline part of antimony, biſmuth, moſt commonly are mixed with black copper in a multitude of different proportions. Nay, it is ſelf-evident, that gold and ſilver, which are diſſolvable by all theſe matters, are collected in ſuch a regulus when they have been firſt hidden in the ore. Beſides, ſulphur and arſenic are not always altogether abſent. For they can hardly be expelled ſo perfectly by the many preceeding roaſtings, but there remain ſome veſtiges of them, which are not diſſipated by a ſudden melting, eſpecially in a cloſe veſſel, wherein the flux ſwimming at top hinders the action of the air. Nay, arſenic is rather fixed by the black flux, and aſſumes a reguline ſemi-metallic form, while it is at the ſame time preſerved from diſſipating by the copper.

PROCESS VI.

To reduce black copper into pure copper by ſcorification.

"Separate a ſpecimen of your black copper, of the weight of two ſmall docimaſtical centners at leaſt; and do it in the ſame manner, and with the ſame precautions, as if you would detect a quantity of ſilver in black copper.

"Then with lute and coal-duſt make a bed in the cavity of a teſt moiſtened: when this bed is dry, put it under the muffle of the docimaſtical furnace, in the open orifice of which there muſt be bright burning coals, wherewith the teſt muſt likewiſe be ſurrounded on all parts. When the whole is perfectly red-hot, put your copper into the fire, alone, if it contains lead; but if it is altogether deſtitute of it, and a ſmall quan- of glaſs of lead, and with a pair of hand-bellows increaſe the fire, that the whole may melt with all ſpeed: this done, let the fire be made a little violent, and ſuch as will ſuffice to keep the metallic maſs well melted, and not much greater. The melted maſs will boil, and ſcorias will be produced, that will gather at the circumference. All the heterogeneous matters being at laſt partly diſſipated, and partly turned to ſcorias, the ſurface of the pure melted copper will appear. So ſoon as you ſee it, take the pot out of the fire, and extinguiſh it in water: then examine it in a balance; and if lead has been at firſt mixed with your black copper, add to the regulus remaining of the pure copper one 15th part of its weight which the copper has loſt by means of the lead, then break it with a vice; and thus you will be able to judge by its colour and malleability, and by the ſurface of it after it is broken, whether the purifying of it has been well performed or no. But whatever caution you may uſe in the performing of this proceſs, the product will nevertheleſs be always leſs in proportion than what you can get by a greater operation, provided the copper be well purified in the ſmall trial.

"*Remarks.* This is the laſt purifying of copper, whereby the ſeparation of the heterogeneous bodies begun in the foregoing proceſs is completed as perfectly as it poſſibly can be. For, except gold and ſilver, all the other metals and ſemimetals are partly diſſipated and partly burnt, together with the ſulphur and arſenic. For in the fuſion they either turn of themſelves to ſcoria or fumes, or this is performed by means of iron, Eſſaying of Ores of Copper.

iron, which chiefly abſords ſemimetals, ſulphur, and arſenic, and the deſtruction of it is at the ſame time accelerated by them. Thus the copper is precipitated out of them pure; for it is ſelf-evident, that the unmetallic earth is expelled, the copper being reduced from a vitreſcent terreſtial to a metallic ſtate, and the arſenic being diſſipated by means of which the ſaid earth has been joined to the coarſer reguluſes of the firſt fuſion.. But there is at the ſame time a good quantity of copper that gets into the ſcorias: however, a great part of it may be reduced out of them by repeating the fuſion.

"The fire in this proceſs muſt be applied with all imaginable ſpeed, to make it ſoon run: for if you neglect this, much of your copper is burnt; becauſe copper that is only red-hot, cleaves much ſooner, and in much greater quantity, into half-ſcorified ſcales, than it is diminiſhed in the ſame time when melted. However, too impetuous a fire, and one much greater than is neceſſary for the fuſion of it deſtroys a much greater quantity of it than a fire ſufficient only to put it in fuſion would do. For this reaſon, when the purifying is finiſhed, the body melted muſt be extinguiſhed in water together with the veſſel, leſt, being already grown hard, it ſhould ſtill remain hot for a while; which muſt be done very carefully to prevent dangerous exploſions.

"The ſcoria of the above proceſs frequently contains copper. To extract which, let two or three docimaſtical centners of the ſcoria, if it be charged with ſulphur, be beat to a ſubtile powder, and mix it, either alone, or if its refractory nature requires it, with ſome very fuſible common pounded glaſs without a reducing ſaline flux, and melt it in a cloſe veſſel, and in a fire having a draught of air; by which you will obtain a regulus.

"But when the ſcoria has little or no ſulphur at all in it, take one centner of it, and with the black flux manage it as you do the fuſible copper ore, (proceſs I.) by which you will have a pure regulus."

PROCESS VII.

The following proceſs is tranſlated from Mr Gellert's *Elements of Eſſaying*, and deſcribes a new method of eſſaying ores, concerning which, ſee the ſection *Of Eſſaying in general*, p. 338. col. 2.

To eſſay copper ores.

Roast a quintal of ore [in the manner deſcribed in proceſs IV.]: add to it an equal quantity of borax, half a quintal of fuſible glaſs, and a quarter of a quintal of pitch: put the mixture in a crucible, the inner ſurface of which has been previouſly rubbed with a fluid paſte of charcoal-duſt and water: cover the whole with pounded glaſs mixed with a little borax, or with decrepitated ſea-ſalt: put a lid on the crucible, which you will place in an air-furnace, or in a blaſt-furnace: when the fire ſhall have extended to the bottom of the coals, let it be excited briſkly during half an hour, that the crucible may be of a briſk red colour: then withdraw the crucible, and when it is cold break it: obſerve if the ſcoria be well made: ſeparate the regulus, which ought to be ſemi-ductile; and weigh it. This regulus is black copper; which muſt be purified, as in proceſs VI.

Eſſaying of Ores of Copper.

If the ore be very poor, and inveloped in much earthy and ſtony matters; to a quintal of it, a quintal and a half of borax, a quarter of a quintal of pitch, and ten pounds of calx of lead or minium, muſt be added. The calx of lead will be revived, and will unite with the ſcattered particles of the copper, and together with theſe will fall to the bottom of the crucible, forming a compound regulus. When the ores of copper are very rich, half a quintal of borax and a quarter of a quintal of glaſs will be ſufficient for the reduction. If the ore is charged with much antimony, a half or three quarters of a quintal of clean iron-filings may be added; otherwiſe the large quantity of antimony might deſtroy the copper, eſpecially if the ore contained no lead. If iron be contained in copper ore, as in pyrites, ſome pounds of antimony, or of its regulus, may be added in the eſſay; as theſe ſubſtances more readily unite with iron than with copper, and therefore diſengage the latter metal from the former.

PROCESS VIII.

To eſſay ores of copper by humid ſolution

Some pyrites and ores contain ſo ſmall a quantity of copper, that it cannot be ſeparated by the above proceſſes, but is deſtroyed by the repeated roaſtings and fuſions. Theſe, and indeed any copper-ores, may be eſſayed by humid ſolution, or by menſtruums.

1. By roaſting a ſulphureous ore, the ſulphur is burnt or decompoſed, its phlogiſton with part of the acid evaporating, while the remaining part of the acid combines with the metals, eſpecially with the copper and iron contained in the ore. Accordingly, from an ore thus roaſted, a vitriolic ſolution may be obtained by lixiviation with warm water, eſpecially if the ore has been expoſed, during a few days after it has been roaſted, to a moiſt air; as the water thus gradually applied unites better with the combination of the metallic calxes with the concentrated vitriolic acid of the ſulphur: but all the copper is not thus reduced by one operation to a vitriol. More ſulphur muſt therefore be combined with the reſiduous ore by fuſion, and muſt be again burnt off, that the remaining part of the copper may be attacked by ſome of the acid of the ſulphur. By repeating this operation, almoſt all the copper and iron will be reduced to a vitriolic lixivium, from which the copper may be ſeparated and precipitated by adding clean pieces of iron.

2. Copper-ores may be more eaſily eſſayed by humid ſolution in the following manner:

Roaſt the mineraliſed ores in the manner directed in Proceſs IV. and pulveriſe them. If the ores be calciform, they do not require a previous roaſting. Put this powder into a matraſs capable of containing ten times the quantity of the ore; pour upon the ore ſome water: ſet the matraſs in a ſand-bath, that the water may boil: pour off the lixivium: add to the reſidous ore more water, with ſome vitriolic or marine acid: digeſt as before in the ſand-bath, and add this lixivium to the former: repeat this operation, till you find that the acid liquor diſſolves no more metal

By adding clean plates of iron you may precipitate the copper, which ought then to be collected, fuſed with a little borax and charcoal duſt, and weighed.

We may remark, that although copper is not ſoluble by a dilute vitriolic acid, yet the calx of it obtained by roaſting the ore, and alſo the calciform ores, are readily ſoluble in that acid.

3. Stahl adviſes to eſſay copper ores by boiling them, after they have been roaſted and powdered, in water, together with tartar and common ſalt, or with alum and common ſalt: but we have not found this method ſo effectual as the preceding.

PROCESS IX.

Dr Fordyce's method of eſſaying copper ores, by means of aqua regia. [Phil. Tranſ. for 1781, vol. lxxx. art. 3.]

THIS method conſiſts only in pouring a quantity of an aqua regia compoſed of equal parts of the nitrous and muriatic acids upon a ſmall quantity of the ore in powder, till a freſh affuſion of the menſtruum ſhows no green or blue tinge; by which means all the metalline part of the ore will be diſſolved. It is then to be precipitated by means of a ſolution of fixed alkali, or volatile alkali cautiouſly managed will anſwer the ſame purpoſe. The metal then appears in form of a green precipitate called *green verditer;* but is mixed with what calcareous earth might have been contained in the ore; which the acids would diſſolve, and the fixed alkali, if that kind was uſed, would precipitate. The cauſtic volatile alkali would not throw down this earth, and is therefore to be preferred to any other; but care muſt be taken to hit the point of ſaturation very exactly with it, as it violently diſſolves the metal if added in too great quantity. Dr Fordyce orders this green calx to be diſſolved in vitriolic acid, and then, by adding a piece of clean iron to the ſolution, all the copper contained in the ore will be obtained in its metallic form.

This method can be ſubject to no fallacy, unleſs the ore contains aluminous matter; in which caſe ſome of the earth of alum will be mixed with the metal, as that earth will be precipitated by fixed alkali, by cauſtic volatile alkali, and by iron. This, however, may very effectually be prevented by diſſolving the green calx firſt in volatile alkali, and then in vitriolic acid. It is even probable, that by reducing the ore to a very fine powder, and treating it with cauſtic alkali, all the metal might be ſeparated from the ore, without the trouble of uſing aqua regia. For the principles on which this method is conducted, ſee the article CHEMISTRY *paſſim*.

SECT. V. *Ores of Lead.*

§ 1. LEAD is ſeldom found native (E) and malleable. Neither, ſays Mr Macquer (F), is it found in form of calx or precipitate, as copper is, becauſe it is much leſs liable to loſe its phlogiſton by the action of air and water: therefore almoſt all lead is found naturally mineraliſed.

Lead is generally mineraliſed by ſulphur (G). Its ores have a dark white, but a ſhining metallic colour. Theſe ores, although they form irregular maſſes, are internally regularly diſpoſed, and ſeem to be compoſed of cubes of different ſizes applied to each other, but not adherent. Theſe ores are generally diſtinguiſhed by the name of *Galena*. They commonly contain about three quarters of lead and a quarter of ſulphur. They are accordingly heavy and fuſible, although much leſs ſo than pure lead.

Moſt lead-ores contain ſilver; none but thoſe of Willach in Corinthia are known to be quite free from it: ſome of them contain ſo much of it, that they are conſidered as improper ores of ſilver. The ſmaller the cubes of galena are, the larger quantity of ſilver has been remarked to be generally contained.

§ 2. *Lead ores may be eſſayed*, 1. By means of the black flux, in the manner directed by Mr Cramer, as follows:

"Let one or more quintals of this ore be groſsly powdered, and roaſted in a teſt till no more ſulphureous vapours be exhaled, and then reduced to a finer powder; it is then to be accurately mixed with twice its weight of a black flux, a fourth part of its weight of clean filings of iron and of borax. The mixture is to be put into a good crucible, or rather into a teſt; it is then to be covered with a thickneſs of two or three fingers of decrepitated ſea-ſalt; the crucible is to be cloſed, and placed in a melting furnace, which is to be filled with unlighted charcoal, ſo that the top of the crucible ſhall be covered with it. Lighted coals are then to be thrown upon the unkindled charcoal, and the whole is left to kindle ſlowly, till the crucible be red-hot; ſoon after which a hiſſing noiſe proceeds from the crucible, which is occaſioned by the reduction of the lead: the ſame degree of fire is to be maintained while this noiſe continues, and is afterwards to be ſuddenly

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(E) Cronſtedt doubts whether any native lead has been found. Linnæus ſays, he has ſeen what externally appeared to be ſuch.

(F) But he is miſtaken. As lead unites ſtrongly with vitriolic acid, we might expect to meet ochres of this metal as well as of copper. Accordingly we find ſome calciform ores of lead. 1. A pure calx of lead, in form of a friable ochre, *ceruſſa nativa*, found on the ſurface of galena; or it is indurated with a radiated or fibrous texture, of a white or yellowiſh green colour, and reſembling ſpar; it is called *ſpatum plumbi*, *ſparry lead-ore*, and *lead-ſpar*. 2. A calx of lead is found mixed with calx of arſenic, forming the ore called *arſenicated lead-ſpar*. Sometimes alſo that calx is mixed with calcareous earth.

(G) Lead is mineraliſed, 1. With ſulphur; ſuch are the ſeveral kinds of ſteel-grained and teſſelated galenas, which alſo contain generally ſome ſilver. 2. With ſulphurated iron and ſilver. It is fine-grained or teſſelated, and is diſtinguiſhed from the former by yielding a black ſlag when ſcorified, whereas the former yields a yellow ſlag. 3. With ſulphurated antimony and ſilver. *Plumbum ſtibiatum Linnæi.* Its colour is ſimilar to that of galena, and its texture is ſtriated. 4. With ſulphur and arſenic. This ore is ſoft, almoſt malleable, like lead. From this ore lead may be melted by the flame of a candle.

denly increaſed, ſo as to make a perfect fuſion; in which ſtate it is to be continued during a quarter of an hour; after which it is to be extinguiſhed; and the operation is then finiſhed." The filings of iron are added to the mixture to abſorb the ſulphur; a certain quantity of which generally remains united with the lead-ore, notwithſtanding the roaſting. We need not fear leſt this metal ſhould unite with the lead and alter its purity; becauſe, although the ſulphur ſhould not hinder it, theſe two metals cannot be united. The refractory quality of the iron does not impede the fuſion; for the union it forms with the ſulphur renders it ſo fuſible, that it becomes itſelf a kind of flux. This addition of iron in the eſſay of lead-ores would be uſeleſs, if the ores were ſufficiently roaſted, ſo that no ſulphur ſhould remain.

Or, 2. By the following proceſs of Mr Gellert.

"Mix a quintal of roaſted lead-ore with a quintal of calcined borax, half a quintal of glaſs finely pulveriſed, a quarter of a quintal of pitch, and as much of clean iron-filings: put this mixture into a crucible wetted with charcoal-duſt and water: place the crucible before the nozzle of the bellows of a forge, and when it is red raiſe the fire during 15 or 20 minutes; then withdraw the crucible, and break it when cold."

Some very fuſible ores, ſuch as the galena of Derbyſhire, may be eſſayed, as large quantities of it are ſmelted, without previous roaſting, and without addition, merely by fuſion during a certain time. For this purpoſe nothing more is requiſite than to keep the ore melted in a crucible with a moderate heat, till all the ſulphur is deſtroyed, and the metal be collected. To prevent the deſtruction of any part of the metal after it is ſeparated from the ſulphur, ſome charcoal duſt may be thrown over the ore, when put into the crucible: but if the galena be mixed with pyrites, eſpecially arſenical pyrites, it requires much roaſting and ſaline fluxes.

SECT. VI. *Tin Ores.*

§ 1. TIN is very ſeldom found pure, but almoſt always mineraliſed, and chiefly by arſenic.

The richeſt ore of tin is of an irregular form, of a black or tarniſhed colour, and almoſt the heavieſt of all ores. The cauſe of this extraordinary weight is, that it contains much more arſenic than ſulphur, whereas moſt ores contain more ſulphur than arſenic.

The moſt common tin ore is of the colour of ruſt, which proceeds from a quantity of iron or of iron-ore mixed with it. The tin-ores of Saxony and Bohemia appear to be all of this kind.

One kind of tin-ore is ſemi-tranſparent and like ſpar. Laſtly, ſeveral kinds of garnets are enumerated by mineralogiſts among tin-ores, becauſe they actually contain tin.

The county of Cornwall, in England, is very rich in tin-ores; and the tin contained in them is very pure. From tin-mines in the Eaſt Indies tin is brought, called *Malacca tin*. No mines of tin have been diſcovered in France; only in Bretagne garnets are found which contain ſome tin.

Native tin is ſaid to have been found in Saxony and Malacca. Its ores are all of the calciform kind, excepting black-lead, which appears to be tin mineraliſed by ſulphur and iron.

The calciform ores of tin are, 1. Tin-ſtone, which is of a blackiſh-brown colour, and of no determinate figure; and tin-grains, or cryſtals of tin, which reſemble garnets, and are of a ſpherical or polygonal figure, which they have probably acquired by the attrition of their angles. The tin-ſtone ſeems to conſiſt of attrited tin-grains. This ore is calx of tin united with calx of arſenic, and frequently with calx of iron. 2. Garnets are ſaid to contain calx of tin united with calx of iron. 3. Manganeſe is ſaid alſo to contain tin.

§ 2. *Ores of tin may be eſſayed* in the ſame manner, according to Cramer, as he directed for the eſſay of lead-ores, *ſupra*. He further makes upon this eſſay the following remarks.

1. Tin-ore, on account of its greater gravity, admits better of being ſeparated, by elutriation or waſhing, from earths, ſtones, and lighter ores. 2. A moſt exact ſeparation of earths and ſtones ought to be made, becauſe the ſcorification of theſe by fluxes require ſuch a heat as would deſtroy the reduced tin. 3. The iron ought to be ſeparated by a magnet. 4. By a previous roaſting, the arſenic is diſſipated, which would otherwiſe carry off a great deal of tin along with it in a melting heat, would change another part of it into aſhes, and would vitiate the remaining tin. 5. The eſſay of tin is very precarious and uncertain; becauſe tin once reduced is eaſily deſtructible by the fire, and by the ſaline fluxes requiſite for the reduction.

Mr Gellert directs, that ores of tin ſhould be eſſayed in the following manner:

"Mix a quintal of tin-ore, waſhed, pulveriſed, and twice roaſted, with half a quintal of calcined borax, and half a quintal of pulveriſed pitch: theſe are to be put into a crucible moiſtened with charcoal-duſt and water, and the crucible placed in an air-furnace; after the pitch is burnt, give a violent fire during a quarter of an hour; and then withdraw your crucible. If the ore be not very well waſhed from the earthy matters, as it ought to be, a larger quantity of borax is requiſite, with ſome powdered glaſs, by which the too quick fuſion of the borax is retarded, and the precipitation of the earthy matters is prevented. If the ore contains iron, to the above mixture may be added ſome alkaline ſalt.

SECT. VII. *Ores of Iron.*

§ 2. IRON is ſeldom found in its metallic ſtate, and free from admixture; though Cramer gives an account of an ore which needs only to be put into a forge, and heated to a welding heat. Several ſands and earths alſo have the appearance of iron, and are even attractable by a magnet. The ore mentioned by Cramer is found vitrefied: with moderate blows the ſcorias are thrown out, and a maſs of iron obtained, which, by being put into the forge again, gives tough iron without any other proceſs. But in general this metal is found in the ſtate of a calx; or, though it is combined with a great quantity of the principle of inflammability, it has ſeldom enough of the metallic form; and it is very often intermixed with a certain proportion of ſulphur. The minerals wrought for iron are three, *viz.* iron ore, iron-ſtone, and bog-ore.

Ores of Iron.

The iron ore is found in veins as the ores of other metals are, and the appearance is very various; ſometimes it has a ruſty iron colour reſembling that of iron; ſometimes it has a reddiſh caſt; often it is formed into a ſort of cryſtallizations which are protuberant knobs on the outſide; and theſe conſiſt of fibres tending to a common centre: and it is of a dark colour like coagulated blood. It is called *hæmatites* or *blood-ſtone*; and conſiſts of a calx of iron with a ſmall quantity of vitriolic acid.

Iron-ſtone in Britain is clay found in ſtrata with coal: but which contains a large quantity of iron, ſo as to make the working profitable. Sometimes it has little appearance of iron; but when burnt with a certain degree of heat, it becomes of a deep red.

The bog-ore is an ochre of iron, and is found generally in low ſituations, and in ſprings containing a ſmall quantity of iron, which flowing over theſe grounds depoſits it in the form of ochre; and after a number of ages it proves a rich mine of iron, and it is extracted from a calx of this kind in many parts of the world. There is alſo a particular kind of ſpar found in different countries of a pale blue colour, ſo that from its firſt appearance we would expect copper; but it contains a ſmall quantity of iron, and is a combination of the metal with inflammable matter, as in Pruſſian blue.

The loadſtone is a noted iron ore. It is always found in veins, and it is alledged that it is only poſſeſſed of its magnetic qualities when near the ſurface. In appearance, it does not differ from many of the ores of iron, and treated as an ore, it affords a conſiderable quantity of metal.

Neither is iron generally mineraliſed ſo diſtinctly as other metals are, unleſs in pyrites and ores of other metals.

Moſt of the minerals called *iron ores* have an earthy, ruſty, yellowiſh, or browniſh appearance, which proceeds from the facility with which the true iron ores are decompoſed.

Iron is the moſt common and moſt abundant of all metals. In Europe, at leaſt, we cannot find an earth, a ſand, a chalk, a clay, a vitrifiable or calcinable ſtone, or even the aſhes of any ſubſtance, which do not contain an earth convertible into iron. All earths and ſtones which are naturally yellow or red, and all thoſe which acquire theſe colours by calcination, receive them from the ferruginous earth mixed with them. The yellow and red ochres conſiſt almoſt ſolely of this earth: the black and heavy ſands are generally very ferruginous.

The iron ore moſt commonly found is a ſtone of the colour of ruſt, of an intermediate weight betwixt thoſe of ores in general and of unmetallic ſtones. This ore has no determinate form, and eaſily furniſhes an iron of good quality.

Blood-ſtone or hematites, ſanguine or red-chalk, and emery, are iron ores; ſome of which, for inſtance blood-ſtone, are almoſt all iron. Moſt of theſe ſubſtances require but a ſlight calcination to be rendered very attractable by a magnet, and ſoluble in aquafortis; but the iron obtained form them is of a bad quality, and they are therefore neglected. Iron from the hematites is very brittle; that obtained from ochres is red-ſhort. All theſe iron ores are ſo refractory, that they can ſcarcely be fuſed.

Eſſaying of Ores of Iron.

Iron ores are very various in their form; or rather they have no determinate form. Sometimes they are earths, ſometimes ſtones, ſometimes grains. Accordingly, thoſe naturaliſts who attend only to the external form of things in claſſing and ſubdividing minerals, have been obliged to multiply the names of iron ores; hence they are called *iron ores in form of peaſe*, *of beans*, *of coriander ſeeds*, *of pepper-corns*, *of cinnamon*, &c. which Mr Cramer treats as ridiculous trifles.

§ 2. *Ores of iron may be eſſayed* by the following proceſs:

PROCESS I.

[*CRAMER's Art of Aſſaying*, Proc. 54.]

To reduce a precipitate iron out of its ore in a cloſe veſſel.

" ROAST for a few minutes in a teſt under a muffle, and with a pretty ſtrong fire, two centners of the ſmall weight of your iron ore groſsly pulveriſed; that the volatiles may be diſſipated in part, and the ore itſelf be ſoftened in caſe it ſhould be too hard. When it is grown cold, beat it extremely fine, and roaſt it a ſecond time, as you do the copper-ore, but in a much ſtronger fire, till it no longer emits any ſmell; then let it grow cold again. Compoſe a flux of three parts of the white flux, with one part of fuſible pulveriſed glaſs, or of the like ſterile unſulphureous ſcorias, and add ſandiver and coal-duſt, of each one-half part; add of this flux three times the quantity of your roaſted ore and mix the whole very well together; then chooſe a very good crucible, well rubbed with lute within, to ſtop the pores that may be here and there unſeen; put into it the ore mixed with the flux; cover it over with common ſalt; and ſhut it cloſe with a tile, and with lute applied to the points.

" Put the wind-furnace upon its bottom-part, having a bed made of coal-duſt. Introduce beſides into the furnace a ſmall grate ſupported on its iron bars, and a ſtone upon it, whereon the crucible may ſtand as on a ſupport: ſurround the whole with hard coals, not very large, and light them at top. When the veſſel begins to grow red, which is indicated by the commons ſalt's ceaſing to crakle, ſtop with groſs lute the holes of the bottom part, except that in which the nozzle of the bellows is received: blow the fire, and excite it with great force, adding now and then freſh fuel, that the veſſel may be never naked at top; having thus continued your fire in its full ſtrength for three quarters of an hour, or for a whole hour, take next the veſſel out of it, and ſtrike ſeveral times the pavement upon which it is ſet, that the ſmall grains of iron which happen to be diſperſed may be collected into a regulus, which you will find after having broken the veſſel.

" When the regulus is weighed, try its malleability: then make it red-hot; and when ſo, ſtrike it with a hammer: if it bears the ſtrokes of a hammer, both when red hot and when cold, and extends a little, you may pronounce your iron very good; but if, when either hot or cold, it proves brittle, you may judge it to be not quite pure, but ſtill in a ſemi-mineral condition.

“ *Remarks.* The arſenic, but eſpecially the ſulphur muſt be diſſipated by roaſting: for the former renders the iron brittle; and the latter not only does the ſame, but, being managed in a cloſe veſſel, with a ſaline alkaline flux, turns to a liver of ſulphur; to the action of which iron yielding in every reſpect, it can upon no account be precipitated, and if not the whole, a great part of it at leaſt is retained by the ſulphureous ſcoria; ſo that in this caſe you commonly in vain look for a regulus.

“ The iron obtained from this firſt precipitation has hardly ever the requiſite ductility, but is rather brittle; the reaſon of which is, that the ſulphur and arſenic remains in it; for notwithſtanding that the greateſt part of theſe is diſſipated by roaſting, yet ſome part adheres ſo ſtrictly, that it can never be ſeparated but with abſorbent, terreſtrial, alkaline ingredients, that change the nature of the ſulphur. For which reaſon, in larger operations, they add quicklime, or marble ſtones that turn into quicklime; which, while they abſorb the ſaid minerals, are, by it and by help of the deſtroyed part of the iron, brought to a fuſion, and turn to a vitrified ſcoria; although, at other times, they reſiſt ſo much by their own nature a vitrification. Another cauſe of the brittleneſs of iron is the unmetallic earth, when it is not yet ſeparated from it; for the iron ore contains a great quantity of it, and in the melting remains joined with the reguline part: whence the iron is rendered very coarſe and brittle. Some iron ores are altogether untractable: nevertheleſs, the reguluſes produced out of them, when broken, have ſometimes a neat ſemimetallic look; which proceeds undoubtedly from a mixture of a ſmall quantity of ſome other metal or ſemimetal.”

PROCESS II.

[The following Proceſs for eſſaying iron ores, and ferruginous ſtones and earths, is extracted from Mr Gellert's *Elements of eſſaying.*]

“ Roast two quintals of iron ore, or of ferruginous earth: divide the roaſted matter into two equal parts: to each of which add half a quintal of pulveriſed glaſs, if the ſubſtance be fuſible and contain much metal; but if otherwiſe, add alſo half a quintal of calcined borax. If the roaſting has entirely diſengaged the ſulphur and arſenic, an eighth part, or even half a quintal, of quicklime may be added. With the above matters mix twelve pounds of charcoal-powder.

“ Take a crucible, and cover the bottom and ſides of its inner ſurface with a paſte made of three parts of charcoal-duſt and one part of clay beat together. In the hollow left in this paſte put the above mixture; preſs it lightly down; cover it with pulveriſed glaſs; and put on the lid of the crucible.

“ Place two ſuch crucibles at the diſtance of about four fingers from the air-pipe, in ſuch a manner that the air ſhall paſs betwixt them at about the third part of the height from the bottom; fill the ſpace betwixt the two crucibles with coals of a moderate ſize: throw lighted coals upon them, that the fire may deſcend and make them red-hot from top to bottom; at firſt let the bellows blow ſoftly, and afterwards ſtrongly during an hour, or an hour and a quarter: then take away the crucible, and break it when cold. A regulus will be found in the bottom, and ſometimes ſome ſmall grains of iron in the ſcoria, which muſt be ſeparated and weighed along with the regulus: then try the regulus whether it can be extended under the hammer when hot and when cold.

“ *Remarks.* To diſengage a metal from the earthy matters mixed with it by fire, we muſt change theſe matters into ſcoria or glaſs. This change may be effected by adding ſome ſubſtance capable of diſſolving theſe matters; that is, of converting them into a ſcoria or glaſs, from which the metallic matters may, by their weight, ſeparate and form a regulus at bottom. Fixed alkali, which is an ingredient of the black and of the white flux, is a powerful ſolvent of earths and ſtones; but the alkali does alſo diſſolve iron, eſpecially when this is in a calcined or earthy ſtate; and this ſolution is ſo much more complete, as the fire is longer applied. Hence, in ordinary eſſays, where an alkaline ſalt is uſed, little or no regulus of iron is obtained. Now, glaſs acts upon and diſſolves earths and ſtones; but not, or very little, iron: conſequently glaſs is the beſt flux for ſuch eſſays, and experience confirms this aſſertion. If the ore contains but little iron we may alſo add to the glaſs ſome borax; but borax cannot be employed ſingly, becauſe it very ſoon fuſes and ſeparates from the ore before the metal is revived. Quicklime is added, not only to abſorb the ſulphur and arſenic remaining in the ore, but alſo becauſe it diſſolves and vitrifies the ſtony and earthy matters of iron ores which are generally argillaceous. For which reaſon, in the large operations for ſmelting iron ore, quicklime, and even in certain caſes gypſum, are commonly added to facilitate the fuſion.

“ The reduction of iron-ore, and even the fuſion of iron, requires a violent and long-continued heat: therefore in this operation, we muſt not employ an inflammable ſubſtance, as pitch, that is ſoon conſumed, but charcoal pulveriſed, which in cloſe veſſels is not ſenſibly waſted. Too much charcoal muſt not be added, elſe it will prevent the action of the glaſs upon the earthy matter of the ore, and conſequently the ſeparation of the metallic part. Experiments have taught me, that one part of charcoal duſt to eight parts of ore was the beſt proportion.

“ When iron is ſurrounded by charcoal, it is not decompoſed or deſtroyed; hence the iron of the ore, which ſinks into the hollow made of paſte of charcoal, duſt and clay, remains there unhurt. The clay is added in this paſte to render it more compact, and to keep the fluid iron collected together.

“ The air is directed betwixt the crucibles; becauſe if it was thrown directly upon them, they would ſcarcely be able to reſiſt the heat. The ſpace betwixt the air-pipe and the crucibles ought to be conſtantly filled with charcoal, to prevent the cold air from touching the crucibles. Ductile and malleable iron is ſeldom obtained in this firſt operation. The ſulphur and arſenic, and frequently alſo an earthy matter adhering to the iron, prevent theſe qualities.”

Eſſaying of Ores of Mercury.

Sect. VIII. *Ores of Mercury.*

§ 1. Mercury is ſometimes found pure, fluid, and in its proper metallic ſtate, only mixed with earths and ſtones. Such are the ores of mercury found near Montpelier, in Tuſcany, and in other places.

But the largeſt quantity of the mercury found in the earth is mineraliſed by ſulphur, and conſequently is in the form of cinnabar.

Mercury is never mineraliſed by arſenic. The richeſt mine of mercury is that of Almaden, in Spain.

Linnæus and Cronſtedt mention a ſingular ore, in which the mercury is *mineraliſed by ſulphur and by copper*. It is ſaid to be of a blackiſh-grey colour, of a glaſſy texture, and brittle. When the mercury and ſulphur are expelled by fire, the copper is diſcovered by giving an opake red colour to glaſs of borax, which, by continuance and increaſe of heat, becomes green and tranſparent.

§ 2. Cramer directs, that *ores of mercury ſhould be eſſayed* by the following proceſſes:

PROCESS I.

To ſeparate mercury out of an unſulphureous ore by diſtillation.

"Take a lump of the pulveriſed ore, one common pound, which muſt ſtand for one centner: put it into a glaſs retort perfectly clean, well loricated, or coated up to half the length of its neck: this muſt be very long, and turned backwards with ſuch a declivity, that a glaſs recipient may be perpendicularly applied to it: but you muſt chooſe a retort ſmall enough, that the belly of it may be filled hardly two-thirds with the ore: this retort muſt be placed ſo, that nothing of the fluid adherent to the neck of it may fall in the cavity of the belly, but that the whole may run forward into the recipient. Finally, have a ſmall recipient full of cold water: let it be perpendicularly ſituated, and receive the neck of the retort in ſuch manner that the extremity of it be hardly one half-inch immerſed into the water.

"Let the retort be ſurrounded with hot burning coals placed at ſome diſtance in form of a circle, leſt the veſſel ſhould burſt by too ſudden a heat: then by degrees bring the burning coals nearer and nearer, and at laſt ſurround the whole retort with them and with freſh charcoal, that it may grow ſlightly red-hot; this fire having been continued for an hour, let the retort cool of itſelf: then ſtrike the neck of it gently, that the large drops which are always adherent to it may fall into the recipient: let the recipient be taken away and the water ſeparated from the mercury by filtration, and let the mercury be weighed. This operation may be more conveniently performed in a ſand-bath; in which caſe the pot containing the ſand muſt be middling red-hot, and the retort be able to touch the bottom of it immediately; nor is it then neceſſary that the retort be loricated."

PROCESS II.

To revive mercury from a ſulphureous cinnabar-ore.

"Beat your ore extremely fine, and mix it exactly with an equal portion of iron-fillings, not ruſty; proceed to diſtil it with the ſame apparatus as in the former proceſs, but urge it with the ſtrongeſt fire that can be made.

"Cinnabar may be ſeparated from ſtones by ſublimation thus: Beat it to a fine powder, and put it into a ſmall narrow glaſs or earthen cucurbit, the belly of which it muſt not fill more than one-third part: ſtop the orifice at top; this muſt be very narrow, to hinder the free action of the air. Put this ſmall cucurbit in an earthen pot above two inches wide in diameter, and gather ſand around this pot about as high as the pulveriſed ore riſes in the cucurbit. Then put it upon burning coals in ſuch manner that the bottom of the pot may be middling red-hot. Thus will your cinnabar aſcend and form a ſolid ponderous ring, which muſt be got out by breaking the veſſel."

Ores of Antimony.

Sect. IX. *Ore of the Regulus of Antimony.*

Native regulus of antimony was firſt obſerved by Mr Swab, in Sweden, in the mine of Salberg, and deſcribed by him in the memoirs of the Swediſh Academy in 1749. Mr Wallerius mentions it in his Mineralogy.

Regulus, of antimony is generally united with ſulphur, with which it forms antimony, which ought to be conſidered as a true ore of the regulus of antimony.

Another ore of regulus of antimony is alſo known of a red colour, in which the regulus is mineraliſed both by arſenic and by ſulphur. This ore reſembles ſome iron ores, and ſome kind of blend. It is diſtinguiſhed by its great fuſibility, which is ſuch, that it may be eaſily melted by the flame of a candle.

The *native regulus* of antimony, by Von Swab, is ſaid by that author to have differed from the regulus of antimony obtained from ores, in theſe two properties, that it was capable of being eaſily amalgamated with mercury, and that its calx ſhot into cryſtals during the cooling.

Beſides the ores of regulus of antimony enumerated above, this ſemimetal is alſo found in ores of other metallic ſubſtances, as in the *plumoſe ſilver-ore*, and in the *ſtibiated lead-ore*.

§ 2. The *ores of antimony may be eſſayed* by the following proceſſes deſcribed by Mr Cramer.

PROCESS I.

To obtain antimony from its ore.

"Choose a melting crucible, or an earthen pot not glazed, that may contain ſome common pounds of the ore of antimony, broken into ſmall bits. Bore at the bottom of the crucible ſome ſmall holes, two lines in diameter. Let the bottom of the veſſel be received by the orifice of a ſmaller one, upon which it muſt be put; and when the ore is put into it, let it be covered with a tile, and all the joints be ſtopped with lute.

"Put theſe veſſels upon the pavement of a hearth and put ſtones all around them at the diſtance of ſix inches. Fill this intermediate ſpace with aſhes, ſo high that the inferior pot be covered to the upper brim. Then put freſh and burning coals upon it, and with a pair of hand-bellows excite the fire, till the

Eſſaying of Ores of Antimony.

the upper veſſels grow red-hot: take off the fire a quarter of an hour after; and when the veſſels are grown cold, open them. You will find that the melted antimony has run through the holes made at the bottom of the upper veſſel into the inferior one, where it is collected."

PROCESS II.

To roaſt crude antimony, or its ore, with or without addition.

"CHOOSE an earthen, flat, low diſh, not glazed; and if it cannot bear being made middling red-hot; cover it over with a coat of lute without. Spread it thinly over with crude antimony, or with its ore, beaten to a pretty coarſe powder, not exceeding a few ounces at once. Put the diſh upon a fire-pan, having a few burning coals in it: increaſe the fire till it begins to ſmoke a little. Meanwhile you muſt inceſſantly move the powder with a piece of new tobacco-pipe; for this cauſes the ſulphur to evaporate the ſooner. If you increaſe the fire a little too ſoon, the powder immediately gathers into large clots, or even begins to melt. When this happens, take it immediately off the fire before it melts entirely. Then pulveriſe it again, and finally make a gentle fire under it. Your black ſhining powder will aſſume an aſh colour almoſt like that of earth, and become more refractory in the fire; wherefore you may then increaſe the fire till your powder grows middling red-hot, and let it laſt till it ceaſes to ſmoke. If you add to your crude antimony pulveriſed, half or an equal quantity of charcoal-duſt, and perform the reſt as above, the roaſting will be done more conveniently: for it does not gather ſo eaſily into clots, and melts with much greater difficulty. When part of the ſulphur is evaporated, add ſome fat to it at ſeveral times. Thus you will ſooner finiſh the operation, and the remaining calx will not be burnt to exceſs. However, if it be thus expoſed to too violent and long-laſting a fire, a great quantity of it evaporates; nor does it ceaſe entirely to ſmoke in a great fire. And it will be enough, if, growing middling red-hot, it does no longer emit the unpleaſant ſmell of the acid of ſulphur."

PROCESS III.

To reduce a calx of antimony into a ſemimetallic regulus.

"MIX ſome calx of antimony with a quarter part of the black flux, and put into the crucible. Cover the veſſel with a tile; make the fire as quickly as the veſſel can bear it, but no greater than is neceſſary to melt the flux. When the whole has been well in fuſion for half a quarter of an hour (which may be tried with a tobacco-pipe, taking off the tile), pour it into the melting cone, which muſt be warm and done over with tallow. Then immediately ſtrike the cone ſeveral times. You will find, when the cone is inverted, a regulus, above which is a ſaline ſcoria."

The methods of *calcining antimony by means of nitre*, are deſcribed under CHEMISTRY, n° 1252—1265; and thoſe of obtaining a *regulus of antimony* without a previous calcination or roaſting, by throwing a mixture of powdered antimony, tartar, and nitre, into a red-hot crucible, and by fuſing this mixture, and of obtaining a *martial regulus of antimony*, are deſcribed at the article REGULUS.

Ores of Biſmuth.

SECT. X. *Ores of Biſmuth.*

§ 1. BISMUTH is found *native*, reſembling the regulus of biſmuth.

An *ochre* of biſmuth, of a whitiſh yellow colour, is mentioned by Cronſtedt; and is different from the ore improperly called *flowers of biſmuth*, which is a calx of cobalt.

Biſmuth is mineraliſed. 1. By *ſulphur*. This ore has the appearance of galena. 2. With *ſulphurated iron*. Biſmuth is found alſo in cobalts, and in ſome ores of ſilver.

§ 2. *Ores of biſmuth* may be *eſſayed* by the following proceſs.

"Biſmuth ore may be melted with the ſame apparatus as was directed for the fuſion of crude antimony out of its ore. Or you may beat your ore to a very fine powder, with the black flux, ſandiver, and common ſalt, in a cloſe veſſel, like the ore of lead or of tin, and melt it in a middling fire, having a draught of air. But as this ſemimetal is deſtructible and volatile, you muſt as quick as poſſible apply it to that degree of fire, which the flux requires to be melted; and ſo ſoon as it is well melted, the veſſel muſt be taken out of the fire; and when it is grown quite cold and broken, you will find your regulus."

Mr Gellert directs that ores of biſmuth ſhould be eſſayed by fuſing a quintal of pulveriſed ore with half a quintal of calcined borax and half a quintal of pulveriſed glaſs, in order to vitrify the adherent earths and ſtones which envelope the biſmuth. But probably the heat requiſite for this vitrification would volatiliſe part of the biſmuth.

If the ore be of the kinds above deſcribed, mineraliſed by ſulphur, or by ſulphur and iron, a previous roaſting would be expedient, which may be performed in the ſame manner as is directed for the roaſting of antimony.

SECT. XI. *Ores of the Regulus of Cobalt.*

COBALT is a grey-coloured mineral, with more or leſs of a metallic appearance. Its grain is cloſe; it is compact and heavy, and frequently covered with an efflorefcence of peach-coloured flowers. Of this ſeveral kinds are known †. All the true cobalts contain the ſemimetal called *regulus* of cobalt, the calx of which becomes blue by vitrification. This regulus is mineraliſed in cobalt by ſulphur, and eſpecially by a large quantity of arſenic. Some cobalts alſo contain biſmuth and ſilver.

Authors have given the name of *cobalt* to many minerals, although they do not contain the ſemimetal abovementioned, but only becauſe they externally reſemble the ore of the regulus of cobalt. But theſe minerals can only be conſidered as falſe cobalts. They are diſtinguiſhable from true cobalt by trying whether they can yield the blue glaſs called *ſmalt*, and the ſympathetic ink. The red efflorefcence is alſo a mark by which true cobalt is diſtinguiſhable from the

† See Cobalt.

falſe: but this effloreſcence only happens when the ore has been expoſed to a moiſt air.

The principal mines of cobalt are in Saxony, where they are dug for the ſake of obtaining zaffre, azure-blue or ſmalt, and arſenic. Very fine cobalt is alſo found in the Pyrenean mountains. It has been likewiſe found in Cornwall and Scotland. And that it is in the eaſtern parts of Aſia, appears from the blue colouring on old oriental porcelain: but probably the mines diſcovered in theſe countries are nearly exhauſted, as conſiderable quantities of zaffre and ſmalt are exported from Europe to China.

Cobalt is heavier than moſt other ores, from the large quantity of arſenic it contains; and in this reſpect it reſembles the ore of tin.

Beſides the grey or aſh-coloured cobalt above deſcribed, which is the moſt frequent, other cobalts are found of various colours and textures, mixed with various ſubſtances. Wallerius enumerates ſix ſpecies of cobalts. 1. The *aſh-coloured ore*, which is regulus of cobalt mineraliſed by arſenic, conſiſting of ſhining leaden-coloured grains. Some ores of this kind are compact reſembling ſteel, and others are of a looſe texture and friable. 2. The *ſpecular ore* is black, ſhining like a mirror, and laminated. This ſpecies is very rare; and is ſuppoſed by Wallerius to be a foliated ſpar, or ſelenites mixed with cobalt. 3. The *vitreous* or *ſlag-like ore*, is of a bluiſh, ſhining colour, compact, or ſpongy. 4. *Cryſtallized ore*, is a grey, deep-coloured cobalt, conſiſting of cluſters of cubical, pyramidal, priſmatic cryſtals. 5. *Flowers of cobalt*, red, yellow, or violet. Theſe flowers ſeem to be formed from ſome of the above-deſcribed compact ores, decompoſed by expoſure to moiſt air. This decompoſition is ſimilar to that which happens to ferruginous and cupreous pyrites. 6. The *earthy cobalt* is of a greeniſh white, or of a yellow colour, and of a ſoft and friable texture. This ſpecies ſeems to be an ochre of cobalt; and is formed perhaps from the flowers of cobalt further decompoſed, in the ſame manner as a martial ochre is formed from the ſaline effloreſcence of decompoſing pyrites; when this effloreſcence is further decompoſed by expoſure to moiſt air; by which the vitriolic acid contained in it is expelled, and the effloreſcence is changed from a ſaline ſtate to that of an ochre or calx.

Beſides theſe proper ores, cobalt is alſo found in a blue clay along with native ſilver, in ores of biſmuth, and in the mineral called *kupfernickel*. See NICKEL.

The *eſſay* of cobalt is deſcribed at the article REGULUS *of Cobalt*.

SECT. XII. *Ores of Zinc*.

§ 1. THE proper ore of zinc is a ſubſtance which has rather an earthy or ſtony than metallic appearance, and is called *calamy*, *calamine*, or *lapis calaminaris*. This ſtone, although metallic, is but moderately heavy, and has not the brilliancy of moſt other ores. Its colour is yellow, and like that of ruſt. It is alſo leſs denſe than other metallic minerals. It ſeems to be an ore naturally decompoſed. The calamine is not worked directly to obtain zinc from it, becauſe this would only ſucceed in cloſe veſſels, and conſequently with ſmall quantities, according to Mr Margraaf's proceſs. But it is ſucceſsfully employed for the converſion of copper into braſs by cementation, by which the exiſtence of zinc in that ſtone is ſufficiently proved.

Mr Wallerius enumerates alſo amongſt the ores of zinc a very compounded mineral, conſiſting of zinc, ſulphur, iron, and arſenic. This mineral, called *blend*, reſembles externally the ore of lead, and hence has been called *falſe galena*. Theſe blends have different forms and colours; but are chiefly red, like the red ore of antimony.

Zinc is obtained from certain minerals in the Eaſt Indies, of which we know little.

Calciform ores of zinc, according to Cronſtedt, are pure or mixed. The pure are indurated, and ſometimes cryſtallized, reſembling lead-ſpar. The mixed ore contains alſo ſome calx of iron. This is *calamine*. It is whitiſh, yellowiſh, reddiſh, or brown.

Zinc is *mineraliſed*, 1. By *ſulphurated iron. Ore of zinc*. Wallerius ſays, lead is ſometimes contained in this ore. It is white, blue, or brown. 2. By *ſulphur, arſenic, and iron. Blend*, or *pſeudo-galena*, or *falſe-galena*, or *black-jack*. Theſe are of various colours, white, yellowiſh, brown, reddiſh, greeniſh, black. They conſiſt of ſcales, or are teſſelated. Mr Cronſtedt thinks, that in the blends the zinc is mineraliſed in the ſtate of a calx, and in the ore of zinc in its metallic ſtate.

§ 2. Although the minerals above enumerated have been known, from their property of converting copper into braſs, to be ores of zinc, yet the method of eſſaying them ſo as to obtain the contained zinc was not known, or at leaſt not publiſhed, before Mr Margraaf's Memoir of the Berlin Academy for the year 1746, upon that ſubject. That very able chemiſt has ſhown, that zinc may be obtained from its ores, from the flowers, or from any other calx of zinc, by treating theſe with charcoal-duſt, in cloſe veſſels, to prevent the combuſtion of the zinc, which happens immediately upon its reduction when expoſed to air. For this purpoſe, he put a quantity of finely powdered calamine, or roaſted blend, or other calx of zinc, well mixed with an eighth part of charcoal-duſt, into a ſtrong, luted earthen retort, to which he fitted a receiver. Having placed his retort in a furnace and raiſed the fire, he applied a violent heat during two hours. When the veſſels were cold and broken, he found the zinc in its metallic form adhering to the neck of the retort.

The chief difficulty in this operation is to get an earthen retort ſufficiently compact to retain the vapour of the zinc (for it eaſily pervades the Heſſian crucibles. Stourbridge melting pots, and ſimilar veſſels, as may be ſeen from the quantity of flowers which appear upon their outer ſurface, when zinc or its calxes and any inflammable matter have been expoſed to heat within theſe veſſels), and at the ſame time ſufficiently ſtrong to reſiſt the violent fire which Mr Margraaf requires.

A pretty exact eſſay of an ore of zinc may be made in the followiug manner.

Mix a quantity of pulveriſed roaſted ore or calx of zinc with

Ores of Arſenic.

with an eighth part of charcoal-duſt. Put this mixture into a crucible capable of containing thrice the quantity. Diffuſe equally amongſt this mixture a quantity of ſmall grains or thin plates of copper equal to that of the calamine or ore employed, and upon the whole lay another equal quantity of grains or plates of copper; and laſtly, cover this latter portion of copper with charcoal-duſt. Lute a lid upon the crucible, and apply a red heat during an hour or two. The copper or part of it will unite with the vapour of the zinc, and be thereby converted into braſs. By comparing the weight of all the metal after the operation with the weight of the copper employed, the weight acquired, and conſequently the quantity of zinc united with the copper will be known. The copper which has not been converted into braſs, or more copper with freſh charcoal-duſt, may be again added in the ſame manner to the remaining ore, and the operation repeated with a heat ſomewhat more intenſe, that any zinc remaining in the ore may be thus extracted. A curious circumſtance is, that a much greater heat is required to obtain zinc from its ore by diſtillation, than in the operation now deſcribed of making braſs; in which the ſeparation of the zinc from its ore ſeems to be facilitated by its diſpoſition to unite with copper.

SECT. XIII. *Ores of Arſenic.*

§ 1. THE minerals which contain the largeſt quantity of arſenic are cobalts and white pyrites; although it is alſo contained in other ores, it being one of the mineraliſing ſubſtances. But as cobalt muſt be roaſted to obtain the ſulphur it contains, the arſenic alſo which riſes during this torrefaction is collected, as we ſhall ſee in part III. (SMELTING of ORES), and the particular articles of each of the metallic ſubſtances mentioned in this article.

I. Regulus of arſenic is found native. It is of a leaden colour; it burns with a ſmall flame; and is diſſipated, leaving generally a very ſmall quantity of calx of biſmuth, or of calx of cobalt, and a very little ſilver. When it is of a ſolid and teſtaceous texture, it has been improperly called *teſtaceous cobalt*, in German *ſcherbencobalt*. II. Calx of arſenic is found in form of powder; native flowers of arſenic, or of indurated ſemitranſparent cryſtals; native cryſtalline arſenic. III. Calx of arſenic is mixed, 1. With ſulphur; when yellow, it is called *orpiment*; when red, it is called *native realgar*: the difference of colour depends on the proportion of the two component parts. 2. With

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calx of tin; tin-grains. 3, With ſulphur and ſilver, in the red ſilver ore. 4. With calx of lead, in the lead-ſpar. 5. With calx of cobalt, in the efflorescence of cobalt. IV. Arſenic is mineraliſed, 1. With ſulphurated iron; arſenical pyrites. 2. With iron only; white pyrites, or miſpickle. 3. With cobalt, in almoſt all cobalt-ores. 4. With ſilver. 5. With copper. 6. With antimony.

§ 2. Arſenic may be ſeparated from its ore or earthy matter with which it happens to be mixed, by ſublimation, according to the following proceſs by Mr Cramer.

"Do every thing as was ſaid about mercury, or ſulphur; but let the veſſel which is put into the fire with the ore in it be of earth or ſtone, and the recipient be of glaſs, and of a middling capacity. Nor is it neceſſary that this ſhould be filled with water, ſo it be but well luted. The fire muſt likewiſe be ſtronger and continued longer than for the extracting of ſulphur. Nevertheleſs, every kind of arſenic cannot be extracted in a confined fire: for it adheres to the matrix more ſtrongly than ſulphur and mercury. You will find in the part of the veſſel which is more remote from the fire pulverulent and ſubtile flowers of arſenic; but there will adhere to the poſterior of the neck of the retort ſmall ſolid maſſes, ſhining like ſmall cryſtals, tranſparent, ſometimes gathered into a ſolid ſublimate, and perfectly white, if the ore of the arſenic was perfectly pure; which nevertheleſs happens very ſeldom. The flowers are moſt commonly thin, and of a grey colour: which proceeds from the phlogiſton mixed with the maſs. They are often of a citron or of a golden colour, which is a ſign that there is in the mixture ſome mineral ſulphur; and if the ſublimate be red or yellow, it is a ſign of much ſulphur.

"As all the arſenic contained in the ore is not expelled in cloſe veſſels, you muſt weigh the reſiduum; then roaſt it in a crucible till it ſmokes no longer, or rather in an earthen flat veſſel not glazed, and in a ſtrong fire to be ſtirred now and then with a poker, and then weigh it when grown cold: you will be able thus to know how much arſenic remained in the cloſe veſſel, unleſs the ore contain biſmuth."

If the arſenic be ſulphurated, it may be purified by triturating it with mercury or with fixed alkali, and by ſubliming the arſenic from the remaining ſulphurated mercury or alkali. The method of obtaining a regulus of arſenic is deſcribed at the article *REGULUS of Arſenic*.

PART III.

SMELTING OF ORES.

HAVING ſhown the nature of the principal metallic minerals, and the ſubſtances of which they are compoſed; and alſo explained the proceſſes by which an exact analyſis of theſe compound minerals may be made, and the nature and quantity of the contained metals may be known; in order to complete what relates to this important ſubject, we ſhall deſcribe in this Part the principal operations by which metals, &c. are obtained "in the great," as it is called, or for commercial purpoſes. What we ſhall ſay upon this ſubject will chiefly be extracted from a *Treatiſe on the Smelting of Ores, by Schlutter*, tranſlated from the German into French by M. Hellot; becauſe this, of all the modern works upon that ſubject, appears to be the moſt exact. We ſhall firſt deſcribe the operations upon pyritous matters for the extraction of

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phur, &c. and afterwards the operations by which metallic ſubſtances are extracted from *ores* properly ſo called.

Sect. I. *Extraction of ſulphur from Pyrites and other Minerals.*

In order to obtain ſulphur from pyrites, this mineral ought to be expoſed to a heat ſufficient to ſublime the ſulphur or to make it diſtil in veſſels, which muſt be cloſe, to prevent its burning.

Sulphur is extracted from pyrites at a work at Schwartzember, in Saxony, in the high country of the mines; and in Bohemia at a place called *Alten-Sattel.*

The furnaces employed for this operation are oblong, like vaulted galleries; and in the vaulted roofs are made ſeveral openings. Theſe are called *furnaces for extracting ſulphur.*

In theſe furnaces are placed earthen-ware tubes, filled with pyrites broken into pieces of the ſize of ſmall nuts. Each of theſe tubes contains about 50 pounds of pyrites. They are placed in the furnace almoſt horizontally, and have ſcarcely more than an inch of deſcent. The ends, which come out of the furnace five or ſix inches, become gradually narrower. Within each tube is fixed a piece of baked earth, in form of a ſtar, at the place where it begins to become narrower, in order to prevent the pyrites from falling out, or choaking the mouth of the tube. To each tube is fitted a receiver covered with a leaden pipe, pierced with a ſmall hole to give air to the ſulphur. The other end of the tube is exactly cloſed. A moderate fire is made with wood, and in eight hours the ſulphur of the pyrites is found to have paſſed into the receivers.

The reſiduum of the pyrites, after the diſtillation, is drawn out at the large end, and freſh pyrites is put in its place. From this reſiduum, which is called *burnings of ſulphur*, vitriol is extracted.

The 11 tubes into which were put, at three ſeveral diſtillations, in all nine quintals, or 900 pounds of pyrites, yield from 100 to 150 pounds of crude ſulphur, which is ſo impure as to require to be purified by a ſecond diſtillation.

This purification of crude ſulphur is alſo done in a furnace in form of a gallery, in which five iron cucurbits are arranged on each ſide. Theſe cucurbits are placed in a ſloping direction, and contain about eight quintals and a half of crude ſulphur. To them are luted earthen tubes, ſo diſpoſed as to anſwer the purpoſe of capitals. The noſe of each of theſe tubes is inſerted into an earthen pot called the *fore runner.*

This pot has three openings; namely that which receives the noſe of the tube; a ſecond ſmaller hole, which is left open to give air; and a third in its lower part, which is ſtopped with a wooden peg.

When the preparations are made, a fire is lighted about ſeven o'clock in the evening, and is a little abated as ſoon as the ſulphur begins to diſtil. At three o'clock in the morning, the wooden pegs which ſtop the lower holes of the fore-runners are for the firſt time drawn out, and the ſulphur flows out of each of them into an earthen pot with two handles, placed below for its reception. In this diſtillation the fire muſt be moderately and prudently conducted; otherwiſe leſs ſulphur would be obtained, and it alſo would be of a grey colour and not of the fine yellow which it ought to have when pure. The ordinary loſs in the purification of eight quintals of crude ſulphur is at moſt, one quintal.

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When all the ſulphur has flowed out, and has cooled a little in the earthen-pots, it is caſt into moulds made of beech tree, which have been previouſly dipt in water and ſet to drain. As ſoon as the ſulphur is cooled in the moulds, they are opened, and the cylinders of ſulphur are taken out and put up in caſks. Theſe are called *roll-brimſtone.*

As ſulphur is not only in pyrites, but alſo in moſt metallic minerals, it is evident that it might be obtained by works in the great from the different ores which contain much of it, and from which it muſt be ſeparated previouſly to their fuſion: but as ſulphur is of little value, the trouble of collecting it from ores is ſeldom taken. Smelters are generally ſatisfied with freeing their ores from it, by expoſing them to a fire ſufficient to expel it. This operation is called *torrefaction*, or *roaſting of ores.*

There are, however, ores which contain ſo much ſulphur, that part of it is actually collected in the ordinary operation of roaſting, without much trouble for that purpoſe. Such is the ore of Ramelſberg in the country of Hartz.

This ore, which is of lead, containing ſilver, is partly very pure, and partly mixed with cupreous pyrites and ſilver; hence it is neceſſary to roaſt it.

The roaſting is performed by laying alternate ſtrata of ore and wood upon each other in an open field, taking care to diminiſh the ſize of the ſtrata as they riſe higher; ſo that the whole maſs ſhall be a quadrangular pyramid truncated above, whoſe baſe is about 31 feet ſquare. Below, ſome paſſages are left open, to give free entrance to the air; and the ſides and top of the pyramid are covered over with ſmall ore, to concentrate the heat and make it laſt longer. In the centre of this pyramid there is a channel which deſcends vertically from the top to the baſe. When all is properly arranged, ladlefuls of red-hot ſcoria from the ſmelting furnace are thrown down the channel, by which means the ſhrubs and wood placed below for that purpoſe are kindled, and the fire is from them communicated to all the wood of the pile, which continues burning till the third day. At that time the ſulphur of the mineral becomes capable of burning ſpontaneouſly, and of continuing the fire after the wood is conſumed.

When this roaſting has been continued 15 days, the mineral becomes greaſy; that is, it is covered over with a kind of varniſh: 20 or 25 holes or hollows are then made in the upper-part of the pile in which the ſulphur is collected. From theſe cavities the ſulphur is taken out thrice every day, and thrown into water. This ſulphur is not pure, but crude; and is therefore ſent to the manufacturers of ſulphur, to be purified in the manner above related.

As this ore of Ramelſberg is very ſulphureous, the firſt roaſting, which we are now deſcribing, laſts three months; and during this time, if much rain has not fallen, or if the operation has not failed by the pile falling down or cracking, by which the air has ſo much free acceſs, that the ſulphur is burnt and conſumed, from 10 to 20 quintals of crude ſulphur are by this method collected.

The ſulphur of this ore, like that of moſt others, was formerly neglected, till, in the year 1570, a perſon employed in the mines called *Chriſtopher Sauder*, diſcovered the method of collecting it, nearly as it is done at preſent.

Metallic minerals are not the only ſubſtances from which ſulphur is extracted. This matter is diffuſed in the earth in ſuch quantities, that the metals cannot abſorb it all. Some ſulphur is found quite pure, and in different forms, principally in the neighbourhood of volcanoes, in caverns, and in mineral waters. Such are the opaque kind called *virgin-ſulphur*; the tranſparent kind called *ſulphur of Quito*; and the native flowers of ſulphur, as thoſe of the waters of Aix-la-Chapelle. It is alſo found mixed with different earths. Here we may obſerve, that all thoſe kinds of ſulphur which are not mineraliſed by metallic ſubſtances, are found near volcanoes, or hot mineral waters, and conſequently in places where nature ſeems to have formed great ſubterranean laboratories; in which ſulphureous minerals may be analyſed and decompoſed, and the ſulphur ſeparated, in the manner in which it is done in ſmall in our works and laboratories. However that be, certainly one of the beſt and moſt famous ſulphur-mines in the world is that called *Solfatara*. The Abbé Nollet has publiſhed, in the Memoirs of the academy, ſome intereſting obſervations upon this ſubject, which we ſhall here abridge.

Near Puzzoli, in Italy, is that great and famous mine of ſulphur and alum called at preſent *Solfatara*. It is a ſmall oval plain, the greateſt diameter of which is about 400 yards, raiſed about 300 yards above the level of the ſea. It is ſurrounded by high hills and great rocks, which fall to peices, and whoſe fragments form very ſteep banks. Almoſt all the ground is bare and white, like marle; and is every where ſenſibly warmer than the atmoſphere in the greateſt heat of ſummer, ſo that the feet of perſons walking there are burnt through their ſhoes. It is impoſſible not to obſerve the ſulphur there; for every-where may be perceived by the ſmell a ſulphureous vapour, which riſes to a conſiderable height, and gives reaſon to believe that there is a ſubterraneous fire below, from which that vapour proceeds.

Near the middle of this field there is a kind of baſon three or four feet lower than the reſt of the plain, in which a ſound may be perceived when a perſon walks on it, as if there were under his feet ſome great cavity, the roof of which was very thin. After that the lake Agnano is perceived, whoſe waters ſeem to boil. Theſe waters are indeed hot, but not ſo hot as boiling water. This kind of ebullition proceeds from vapours which riſe from the bottom of the lake, which being ſet in motion by the action of ſubterranean fires, have force enough to raiſe all that maſs of water. Near this lake there are pits, not very deep, from which ſulphureous vapours are exhaled. Perſons who have the itch come to theſe pits, and receive the vapours in order to be cured. Finally, there are ſome deeper excavations, whence a ſoft ſtone is procured which yields ſulphur. From theſe cavities vapours exhale, and iſſue out with noiſe, and which are nothing elſe than ſulphur ſubliming through the crevices. This ſulphur adheres to the ſides of the rocks, where it forms enormous maſſes: in calm weather, the vapours may be evidently ſeen to riſe 25 or 30 feet from the ſurface of the earth.

Theſe vapours, attaching themſelves to the ſides of rocks, form enormous groups of ſulphur, which ſometimes fall down by their own weight, and render theſe places of dangerous acceſs.

In entering the Solfatara, there are warehouſes and buildings erected for the refining of ſulphur.

Under a great ſhed, or hangar, ſupported by a wall behind, and open on the other three ſides, the ſulphur is procured by diſtillation from the ſoft ſtones we mentioned above. Theſe ſtones are dug from under ground; and thoſe which lie on the ſurface of the earth are neglected. Theſe laſt are, however, covered with a ſulphur ready formed, and of a yellow colour: but the workmen ſay they have loſt their ſtrength, and that the ſulphur obtained from them is not of ſo good a quality as the ſulphur obtained from the ſtones which are dug out of the ground.

Theſe laſt mentioned are broken into lumps, and put into pots of earthen ware, containing each about 20 pints Paris meaſure. The mouths of theſe pots are as wide as their bottoms; but their bellies, or middle parts, are wider. They are covered with a lid of the ſame earth, well luted, and are arranged in two parallel lines along two brick walls, which form the two ſides of a furnace. The pots are placed within theſe walls; ſo that the centre of each pot is in the centre of the thickneſs of the wall, and that one end of the pots overhangs the wall within, while the other end overhangs the wall without. In each furnace ten of theſe pots are placed; that is, five in each of the two walls which form the two ſides of the furnace." Betwixt theſe walls there is a ſpace of 15 or 18 inches; which ſpace is covered by a vault reſting on the two walls. The whole forms a furnace ſeven feet long, two feet and a half high, open at one end, and ſhut at the other, excepting a ſmall chimney through which the ſmoke paſſes.

Each of theſe pots has a mouth in its upper part without the furnace, in order to admit a tube of 18 lines in diameter and a foot in length, which communicates with another pot of the ſame ſize placed without the building, and pierced with a round hole in its baſe of 15 or 18 lines diameter. Laſtly, to each of theſe laſt-mentioned pots there is a wooden tub placed below, in a bench made for that purpoſe.

Four or five of theſe furnaces are built under one hangar, or ſhed. Fires are kindled in each of them at the ſame time; and they are thrown down after each diſtillation, either that the pots may be renewed, or that the reſiduums may be more eaſily taken out.

The fire being kindled in the furnace, heats the firſt pots containing the ſulphureous ſtones. The ſulphur riſes in fumes into the upper part of the pot, whence it paſſes through the pipe of communication into the external veſſel. There the vapours are condenſed, become liquid and flow through the hole below into the tub, from which the ſulphur is eaſily turned out, becauſe the form of the veſſel is that of a truncated cone whoſe narrower end is placed below, and becauſe the hoops of the tub are ſo faſtened that they may be occaſionally looſened. The maſs of ſulphur is then carried to the buildings mentioned before, where it is remelted for its purification, and caſt into rolls, ſuch as we receive it.

Extraction of VITRIOL *from pyrites.* See CHEMISTRY.

Extraction of ALUM *from pyritous ſubſtances and from aluminous earths.* See CHEMISTRY.

SECT. II. *Smelting of Ores in general.*

§ 1. As ores conſiſt of metallic matters combined with ſulphur and arſenic, and are beſides intermixed with earthy and ſtony ſubſtances of all kinds, the intention of all the operations upon theſe compound bodies is to ſeparate theſe different ſubſtances from each other. This is effected by ſeveral operations founded on the known properties of thoſe ſubſtances. We now proceed to give a general idea of theſe ſeveral operations.

Firſt of all, the ore is to be ſeparated from the earths and ſtones accidentally adherent to it; and when theſe foreign ſubſtances are in large maſſes, and are not very intimately mixed in ſmall particles with the ore, this ſeparation may be accompliſhed by mechanical means. This ought always to be the firſt operation, unleſs the adherent ſubſtance be capable of ſerving as a flux to the ore. If the unmetallic earths be intimately mixed with the ore, this muſt neceſſarily be broken and divided into ſmall particles. This operation is performed by a machine which moves peſtles, called *bocords* or *ſtampers*. After this operation, when the parts of the mineral are ſpecifically heavier than thoſe of the unmetallic earth or ſtone, theſe latter may be ſeparated from the ore by waſhing in canals through which water flows. With regard to this waſhing of ores, it is neceſſary to obſerve, that it cannot ſucceed but when the ore is ſenſibly heavier than the foreign matters. But the contrary happens frequently, as well becauſe quartz and ſpar are naturally very ponderous, as becauſe the metallic matter is proportionally ſo much lighter as it is combined with more ſulphur.

When an ore happens to be of this kind, it is neceſſary to begin by roaſting it, in order to deprive it of the greateſt part of its ſulphur.

It happens frequently that the pyritous matters accompanying the ore are ſo hard that they can ſcarcely be pounded. In this caſe it is neceſſary to roaſt it entirely, or partly, and to throw it red hot into cold water; by which the ſtones are ſplit, and rendered much more capable of being pulveriſed.

Thus it happens very frequently, that roaſting is the firſt operation to which an ore is expoſed.

When the ſubſtance of the ore is very fuſible, this firſt operation may be diſpenſed with, and the matter may be immediately fuſed without any previous roaſting, or at leaſt with a very ſlight one. For, to effect this fuſion, it is neceſſary that it retain a great quantity of its ſulphur, which, with the other fluxes added, ſerves to deſtroy or convert into ſcoria a conſiderable part of the ſtony matter of the mineral, and to reduce the reſt into a brittle ſubſtance, which is called the *matt of lead* or *of copper*, or other metal contained in the ore. This matt is therefore an intermediate matter betwixt the mineral and the metal; for the metal is there concentrated, and mixed with leſs uſeleſs matter than it was in the ore. But as this matt is always ſulphureous, the metal which it contains cannot have its metallic properties. Therefore it muſt be roaſted ſeveral times to evaporate the ſulphur, before it is remelted, when the pure metal is required. This fuſion of an ore not roaſted, or but ſlightly roaſted, is called *crude fuſion*.

We may here obſerve upon the ſubject of waſhing and roaſting of ores, that as arſenic is heavier than ſulphur, and has nearly the weight of metals, the ores in which it prevails are generally very heavy, and conſequently are ſuſceptible of being waſhed, which is a great advantage. But on the other ſide, as arſenic is capable of volitiſing, ſcorifying, and deſtroying many metals, theſe ores have diſadvantages in the roaſting and fuſion, in both which conſiderable loſs is cauſed by the arſenic. Some ores contain, beſides arſenic, other volatile ſemimetals, ſuch as antimony and zinc. Theſe are almoſt untractable, and are therefore neglected. They are called *mineræ rapaces*, "rapacious ores."

When the metal has been freed as much as is poſſible from foreign matters by theſe preliminary operations, it is to be completely purified by fuſions more or leſs frequently repeated; in which proper additions are made, either to abſorb the reſt of the ſulphur and arſenic, or to complete the vitrification or ſcorification of the unmetallic ſtones and earth.

Laſtly, as ores frequently contain ſeveral different metals, theſe are to be ſeparated from each other by proceſſes ſuited to the properties of theſe metals, of which we ſhall ſpeak more particularly as we proceed in our examination of the ores of each metal.

§ 2. To facilitate the extraction of metallic ſubſtances from the ores and minerals containing them, ſome operations previous to the fuſion or ſmelting of theſe ores and minerals are generally neceſſary. Theſe operations conſiſt of, 1. The *ſeparation* of the ores and metallic matters from the adhering unmetallic earths and ſtones, by hammers and other mechanical inſtruments, and by waſhing with water. 2, There *diviſion* or reduction into ſmaller parts by contuſion and trituration, that by another waſhing with water they may be more perfectly cleanſed from extraneous matters, and rendered fitter for the ſubſequent operations, calcination or roaſting, and fuſion. 3. *Roaſting* or *calcination;* the uſes of which operation, are, to expel the volatile uſeleſs, or noxious ſubſtances, as water, vitriolic acid, ſulphur, and arſenic; to render the ore more friable, and fitter for the ſubſequent contuſion and fuſion; and, laſtly, to calcine and deſtroy the viler metals, for inſtance the iron of copper-ores, by means of the fire, and of the ſulphur and arſenic. Stones, as quartz, and flints, containing metallic veins or particles are frequently made red-hot, and then extinguiſhed in cold water, that they may be rendered ſufficiently friable and pulverable, to allow the ſeparation of the metallic particles.

Roaſting is unneceſſary for native metals; for ſome of the richer gold and ſilver ores; for ſome lead-ores the

Roaſting of Ores.

of the ſulphur of which may be ſeparated during the fuſion; and for many calciform ores, as theſe do not generally contain any ſulphur and arſenic.

In the roaſting of ores, the following attentions muſt be given, 1. To reduce the mineral previouſly into ſmall lumps, that the ſurface may be increaſed; but they muſt not be ſo ſmall, nor placed ſo compactly, as to prevent the paſſage of the air and flame. 2. The larger pieces muſt be placed at the bottom of the pile, where the greateſt heat is. 3. The heat muſt be gradually applied, that the ſulphur may not be melted, which would greatly retard its expulſion; and that the ſpars, fluors, and ſtones, intermixed with the ore, may not crack, fly, and be diſperſed. 4. The ores not thoroughly roaſted by one operation muſt be expoſed to a ſecond. 5. The fire may be increaſed towards the end, that the noxious matters more ſtrongly adhering may be expelled. 6. Fuel which yields much flame, as wood and foſſil coals free from ſulphur, is ſaid to be preferable to charcoal or coaks. Sometimes cold water is thrown on the calcined ore at the end of the operation, while the ore is yet hot, to render it more friable.

No general rule can be given concerning the duration or degree of the fire, theſe being very various according to the difference of the ores. A roaſting during a few hours or days is ſufficient for many ores; while ſome, ſuch as the ore of Ramelſberg, require that it ſhould be continued during ſeveral months.

Schlutter enumerates five methods of roaſting ores. 1. By conſtructing a pile of ores and fuel placed in alternate ſtrata, in the open air, without any furnace. 2. By confining ſuch a pile within walls, but without a roof. 3. By placing the pile under a roof, without lateral walls. 4. By placing the pile in a furnace conſiſting of walls and a roof. 5. By roaſting the ore in a reverberatory furnace, in which it muſt be continually ſtirred with an iron rod.

Several kinds of fuſions of ores may be diſtinguiſhed. 1. When a ſulphureous ore is mixed with much earthy matter, from which it cannot be eaſily ſeparated by mechanical operations, it is frequently melted, in order to diſengage it from theſe earthy matters, and to concentrate its metallic contents. By this fuſion, ſome of the ſulphur is diſſipated, and the ore is reduced to a ſtate intermediate betwixt that of ore and of metal. It is then called a *matt (lapis ſulphureo-metallicus)*; and is to be afterwards treated like a pure ore by the ſecond kind of fuſion, which is properly the ſmelting, or extraction of the metal by fuſion. 2. By this fuſion or ſmelting, the metal is extracted from the ore previouſly prepared by the above operations, if theſe be neceſſary. The ores of ſome very fuſible metals, as of biſmuth, may be ſmelted by applying a heat ſufficient only to melt the metals, which are thereby ſeparated from the adhering extraneous matters. This ſeparation of metals by fuſion, without the vitrification of extraneous matters, may be called *eliquation*. Generally, a complete fuſion of the ore and vitrification of the earthy matters are neceſſary for the perfect ſeparation of the contained metals. By this method, metals are obtained from their ores, ſometimes pure, and ſometimes mixed with other metallic ſubſtances, from which they muſt be afterwards ſeparated; as we

Fuſion of Ores.

ſhall ſee when we treat of the extraction of particular metals. To procure this ſeparation of metals from ores, theſe muſt be ſo thinly liquefied, that the ſmall metallic particles may diſengage themſelves from the ſcoria; but it muſt not be ſo thin as to allow the metal to precipitate before it be perfectly diſengaged from any adhering extraneous matter, or to pervade and deſtroy the containing veſſels and furnace. Some ores are ſufficiently fuſible; but others require certain additions called *fluxes*, to promote their fuſion and the vitrification of their unmetallic parts; and alſo to render the ſcoria ſufficiently thin to allow the ſeparation of the metallic particles.

Different fluxes are ſuitable to different ores, according to the quality of the ore, and of the matrix, or ſtone adherent to it.

The matrixes of two different ores of the ſame metal frequently ſerve as fluxes to each other; as, for inſtance, an argillaceous matrix with one that is calcareous; theſe two earths being diſpoſed to vitrification when mixed, though each of them is ſingly unfuſible. For this reaſon, two or more different ores to be ſmelted are frequently mixed together.

The ores alſo of different metals require different fluxes. Thus calcareous earth is found to be beſt ſuited to iron-ores, and ſpars and ſcoria to fuſible ores of copper.

The fluxes moſt frequently employed in the ſmelting of ores are, calcareous earths, fluors or vitreous ſpars, quartz, and ſand, fuſible ſtones, as ſlates, baſaltes, the ſeveral kinds of ſcoria, and pyrites.

Calcareous earth is uſed to facilitate the fuſion of ores of iron, and of ſome of the poorer ores of copper, and, in general, of ores mixed with argillaceous earths, or with ſelt ſpar. This earth has been ſometimes added with a view of ſeparating the ſulphur, to which it very readily unites: but by this union the ſulphur is detained, and a hepar is formed, which readily diſſolves iron and other metals, and ſo firmly adheres to them, that they cannot be ſeparated without more difficulty than they could from the original ore. This addition is therefore not to be made till the ſulphur be previouſly well expelled.

Fluors or *fuſible ſpars* facilitate the fuſion of moſt metallic minerals, and alſo of calcareous and argillaceous earths, of ſteatites, aſbeſtus, and ſome other unfuſible ſtones, but not of ſiliceous earths without a mixture of calcareous earth.

Quartz is ſometimes added in the fuſion of ferruginous copper ores, the uſe of which is ſaid chiefly to be, to enable the ore to receive a greater heat, and to give a more perfect vitrification to the ferruginous ſcoria.

The *fuſible ſtones*, as *ſlates*, *baſaltes*, are ſo tenacious and thick when fuſed, that they cannot be conſidered properly as fluxes, but as matters added to leſſen the too great liquidity of ſome very fuſible minerals.

The *ſcoria* obtained in the fuſion of an ore is frequently uſeful to facilitate the fuſion of an ore of the ſame metal, and ſometimes even ores of other metals.

Sulphurated pyrites greatly promote the fuſibility of the ſcoria of metals, from the ſulphur it contains. It is chiefly added to difficultly-fuſible copper-ores, to form the ſulphureous compounds called *matts*, that the

ores,

Smelting of Ores of Silver.

ores thus brought into fuſion may be ſeparated from the adhering earthy matters, and that the ferruginous matter contained in them may be deſtroyed, during the ſubſequent calcination and fuſion, by means of the ſulphur.

As in the ores called *calciform*, the metallic matter exiſts in a calcined ſtate; and as calcination reduces the metals of mineraliſed ores (excepting the perfect metals) to that ſtate alſo; therefore all calciform and calcined ores require the addition of ſome inflammable ſubſtance to reduce them to a metallic ſtate. In great works, the charcoal or other fuel uſed to maintain the fire produces alſo this effect.

Metals are ſometimes added in the fuſion of ores of other more valuable metals, to abſorb from theſe ſulphur or arſenic. Thus iron is added to ſulphurated, cupreous, and ſilver ores. Metals are alſo added in the fuſion of ores of other more valuable metals, to unite with and collect the ſmall particles of theſe diſperſed through much earthy matter, and thus to aſſiſt their precipitation. With theſe intentions lead is frequently added to ores and minerals containing gold, ſilver, or copper.

Ores of metals are alſo ſometimes added to aſſiſt the precipitation of more valuable metals. Thus antimony is frequently added to aſſiſt the precipitation of gold intermixed with other metallic matters. Thus far of ſmelting of ores in general.

Sect. III. *Smelting of Ores of Silver.*

§ 1. As ſilver, even its proper ores, is always allayed with ſome other metals from which it is intended to be ſeparated after the ſilver-ore has been well roaſted, it muſt be mixed with a greater or leſs quantity of lead previous to its fuſion.

Lead has the ſame effect in fuſion of gold and ſilver as mercury has upon theſe metals by its natural fluidity; that is to ſay, it unites with them, and ſeparates them from unmetallic matters, which, being lighter, riſe always to the ſurface. But lead has the further advantage of procuring, by its own vitrification, that of all metallic ſubſtances, excepting gold and ſilver. Hence it follows, that when gold and ſilver are obtained by means of mercury, they ſtill remain allayed with other metallic ſubſtances; whereas when they are obtained by fuſion and ſcorification with lead, they are then pure, and not allayed with any metals but with each other.

In proportion as the lead, which has been united to the gold and ſilver of the ore, is ſcorified by the action of the fire, and promotes the ſcorification of the other metallic matters, it ſeparates the perfect metals, and carries with it all the others to the ſurface. There it meets the unmetallic ſubſtances, which it likewiſe vitrifies, and which it changes into a perfect ſcoria, fluid, and ſuch as a ſcoria ought to be to admit all the perfect metal contained in it to precipitate.

When all heterogeneous matters have been thus diſengaged by ſcorification with lead, the perfect metals, to which ſome lead ſtill remains united, are to be further purified by the ordinary operation of the cupel.

The common rule for the fuſion and ſcorification of ſilver-ore with lead, is to add to the ore a quantity of lead ſo much greater as there is more matter to be ſcorified, and as theſe matters are more refractory and of more difficult fuſion. Silver ores, or thoſe treated as ſuch, are often rendered refractory by ferruginous earths, pyritous matters, or cobalts, containing always a conſiderable quantity of an earth which is unmetallic, very ſubtile, and very refractory, and which renders a conſiderable augmentation of the quantity of lead neceſſary.

The quantity of lead which is commonly added to fuſible ſilver ores, that do not contain lead, is eight times the quantity of the ore. But when the ore is refractory, it is neceſſary to add twelve times the quantity of lead, and even more; alſo glaſs of lead, and fluxes, ſuch as the white and black fluxes; to which however borax and powder of charcoal are preferable, on account of the liver of ſulphur formed by theſe alkaline fluxes.

It is neceſſary to obſerve, that ſaline fluxes are only uſed in ſmall operations, on account of their dearneſs. To theſe are ſubſtituted, in the great operations, of which we now treat, ſandiver, fuſible ſcoria, and other matters of little value.

The greateſt part of ſilver now employed in commerce is not obtained from the proper ores of ſilver, which are very ſcarce; but from lead and even copper ores, which are more or leſs rich in ſilver. To give an idea of the manner of treating theſe kinds of ores, from which ſilver is extracted in the great works, we ſhall briefly deſcribe here, after Schlutter, the ſmelting of the ore of Ramelſberg, which contains, as we have already ſaid, ſeveral different kinds of metals, but particularly lead and ſilver.

When this mineral has been diſengaged from its ſulphur as much as poſſible by three very long roaſtings, it is melted, in the Lower Hartz in Saxony, in a particular kind of furnace, called a *furnace for ſmelting upon a hollow or caſſe*. The maſonry of this furnace is compoſed of large thick ſlates, capable of ſuſtaining great heat, and cemented together by clay. The interior part of the furnace is three feet and a half long, and two feet broad at the back part, and one foot only in the front. Its height is nine feet eight inches. It has a foundation of maſonry in the ground; and in this foundation channels are made for the evaporation of the moiſture. Theſe channels are covered over with ſtones called *covering ſtones*. The hollow or caſſe, which is made above theſe, is formed of bricks, upon which are placed, firſt, a bed of clay; then a bed of ſmall ore and ſifted vitriols; and, laſtly, a bed of charcoal powder beat down, called *light braſque*. The anterior wall of the furnace is thinner than the others, and is called the *chemiſe*. The back wall, which is pierced to give paſſage to the pipes of two large wooden bellows, is called the *middle wall*. When the furnace is thus prepared, charcoal is thrown into the hollow, or caſſe; which being kindled, the fire is to be continued during three hours, before the matters to be fuſed are added. Then theſe matters are thrown in, which are not the pure ore, but a mixture of ſeveral ſubſtances, all of which are ſomewhat profitable. The quantity of theſe matters is ſufficient for one day's work; that is, for a fuſion of eighteen hours; and it conſiſts of, 1. Twelve ſchorbens or meaſures of well roaſted Ramelſberg ore (the ſchorben is a meaſure whoſe contents are two

Smelting of Ores of Silver. two feet five inches long, one foot ſeven inches broad, and a little more than a foot deep: it is equal to 32 quintals of that country. Cologn weight, at 123 pounds each quintal). 2. Six meaſures of ſcoria produced by the ſmelting of the ore of Upper Hartz, which is refractory, and what workmen call *ſchl.* 3. Two meaſures of knobben, which is an impure ſcoria containing ſome lead and ſilver, which has been formerly thrown away as uſeleſs, and is now collected by women and children. Beſides theſe other matters are added, containing lead and ſilver, as the teſts employed in refining, the droſs of lead, impure litharge, and any rubbiſh containing metal, which was left in the furnace after the foregoing fuſion. All theſe matters being mixed together, are thrown into the furnace: and to each meaſure of this mixture a meaſure of charcoal is added. The fuſion is then begun by help of bellows; and as it proceeds, the lead falls through the light braſque or charcoal-bed into the hollow, or caſſe, where it is preſerved from burning under the powder of charcoal. The ſcoria, on the other hand, being lighter and leſs fluid, is ſkimmed off from time to time by means of ladles, that it may not prevent the reſt of the lead from falling down into the hollow. Thus, while the fuſion laſts, freſh matters and freſh charcoal are alternately added, till the whole quantity intended for one fuſion, or as they call it, one *day*, be thrown in.

There are ſeveral eſſential things to be remarked in this operation which is very well contrived. Firſt, The mixture of matters from which a little lead and ſilver is procured, which would otherwiſe be loſt; and which have alſo this advantage, that they retard the fuſion of the Ramelſberg ore, which, however well roaſted it has been, retains always enough of the ſulphur and iron of the pyrites mixed with it, to render it too fuſible or too fluid; ſo that without the addition of thoſe matters nothing would be obtained but a matt. It is even neceſſary, notwithſtanding theſe additions, not to haſten the fuſion too much, but to give time for the ore to mix with other matters, elſe it would melt and flow of itſelf before the reſt. Secondly, The fuſion of the ore through charcoal which is practiſed in moſt ſmelting-houſes, and for almoſt all ores, is an excellent method, the principal advantage of which is the ſaving of fuel. The action of the burning charcoal directed immediately upon the mineral, at the ſame time that it melts it more readily and efficaciouſly, alſo ſupplies it with the phlogiſton neceſſary to bring it to a perfect ſtate.

From the Ramelſberg ore after its firſt roaſting a *white vitriol* is obtained and prepared at Goſlar, whoſe baſis was *zinc:* which proves that this ore contains alſo a certain quantity of this ſemimetal. As this ore is ſmelted in a country where the art is well underſtood of extracting every thing which a mineral contains, ſo in this fuſion *zinc* and *cadmia* are obtained in the following manner: When the furnace is prepared for the fuſion, it is neceſſary to cloſe it up in the fore-part before the fuſion is begun.

"Firſt of all, a gritt-ſtone is to be placed, ſupported at the height of three inches. This ſtone is as long as the furnace is broad, and the height of it is level with the hole where the bellows-pipe enters. It is faſtened to each ſide of the furnace, externally and internally with clay. Upon this ſtone a kind of receptacle, or, as it is called, the *ſeat of the zinc* is made in the following manner: A thin ſlaty ſtone is choſen as long as the furnace is broad, and eight inches in breadth. This is placed on the gritt-ſtone above-mentioned, in ſuch a manner that it inclines conſiderably towards the front of the furnace, and that its bottom touches chiefly the gritt-ſtone. It is faſtened with clay, which is alſo laid upon the ſeat of the zinc. Upon this ſeat, which is to receive the zinc, two round peices of charcoal are placed, and alſo a ſtone called the *zinc-ſtone*, which is about a foot and an half in length, and cloſes one part of the front of the furnace. This ſtone alſo is faſtened on each of its ſides with clay. Clay is likewiſe put under the ſtone betwixt the two pieces of charcoal, which hinder it from touching the ſeat of the zinc. The under-part of this ſtone is but ſlightly luted, that the workmen may make an opening for the zinc to flow out. This is made the ſeat or receptacle of the zinc to detain this metallic ſubſtance, which would otherwiſe fall into the hotteſt part of the fire, called by the workmen the *melting place*, and would be there burnt whereas it is collected upon this receptacle during the fuſion, where it is ſheltered from the action of the bellows, and conſequently from too great heat.

"When all the matter to be fuſed in one day is put into the furnace, the blaſt of air is continued till that matter has ſunk down. When it is half way down the furnace, they draw out the ſcoria, that more of the ore and other matters may be expoſed to the greateſt heat. As ſoon as the ſcoria is coolled and fixed a little, two ſhovel-fulls of ſmall wet ſcoria or ſand is thrown cloſe to the furnace, and beat down with the ſhovel; then the workmen open the ſeat or receptacle of zinc, and ſtrike upon the zinc-ſtone to make the ſemimetal flow out. As ſoon as the pureſt part of it has flowed out, it is ſprinkled with water and carried away. Then the workmen ſeparate entirely the zinc-ſtone from the wall of the furnace, and they continue to give it little ſtrokes, that the ſmall particles of zinc diſperſed among the charcoal by an iron fall down. This being done, the ſtone is removed; and the zinc is ſeparated from the charcoal by an iron inſtrument, is cleaned, and remelted along with the zinc that flowed out at firſt, and is caſt into round cakes. The reaſon why the zinc is withdrawn before the bellows ceaſe to blow, is, that if it was left till the charcoal on the ſeat or receptacle was conſumed, it would be moſtly burnt, and little would be obtained. Thus after the zinc is withdrawn, the fuſion is finiſhed by blowing the bellows till the end."

Thus the zinc is ſeparated from the ore of Ramelſberg, and is not confounded in the hollow or caſſe with the lead and ſilver, becauſe, being a volatile ſemimetal, it cannot ſupport the activity of the fire without riſing into vapours, which are condenſed in the place leaſt hot, that is to ſay, upon the ſtones expreſsly prepared for that purpoſe; and which, being much thinner than the other walls of the furnace, are continually cooled by the external air.

It is alſo in this furnace, and after the fuſion of the Ramelſberg ore, that the *cadmia of zinc*, or the *cadmia of furnaces*, is obtained. This ore is compoſed of ſulphureous and ferruginous pyrites of true

lead,

Smelting of Ores of Silver.

lead-ore containing ſilver, and a very hard and compact matter of a dark browniſh grey colour, which is probably a *lapis calaminaris*, or an ore of zinc. Theſe ſeveral matters of the Ramelſberg ore are not ſeparated from each other, either for the roaſting or for the fuſion. Thus there is zinc in all the parts of the roaſted ore; and much more of it would be obtained, if it was not ſo eaſily inflammable. All the zinc which is obtained is preſerved from burning by falling, while in fuſion, behind the chemiſe or fore-part of the furnace, which is, as has been ſaid, a kind of ſchiſtus or ſlate, called by the workmen *ſteel-ſtone*. But the part of this ſemimetal which falls in the middle of the furnace, near the middle-wall, or towards the ſides, being expoſed to the greateſt heat of the fire, is there burnt; and its ſmoke or flowers attaching itſelf on all ſides to the walls of the furnace, undergo there a ſemifuſion, which renders this matter ſo hard and ſo thick, that it muſt be taken away after every fourth fuſion, or, at moſt, after every ſixth fuſion. That which is found attached to the higheſt part of the furnace is the beſt and pureſt. The reſt is altered by a mixture of a portion of lead which it has carried up with it; and which, from its great weight and fixity, has hindered the zinc from riſing ſo high as it would have done alone. Therefore, with this kind of impure cadmia, ductile braſs cannot be made.

Almoſt all the zinc we have, as well as the cadmia of the furnaces, is obtained from the Ramelſberg ore by the proceſs deſcribed, and conſequently is not the produce of a pure ore of zinc or *lapis caliminaris*, which is never fuſed for that purpoſe. Before Mr Margraaf, although it was well known that this ore contained zinc, and that it was employed for the making of braſs, a convenient proceſs for extracting zinc from it was not known; becauſe, when treated by fuſion with fluxes, like other ores, it does not yield any zinc: which proceeds partly from the refractory quality of the earth contained in the calamine, that cannot be fuſed without a very violent fire; and alſo from the volatility and combuſtibility of the zinc, which for this reaſon cannot be collected at the bottom of a crucible, as a regulus under a ſcoria, like moſt metals.

M. Margraaf has remedied theſe inconveniences by diſtilling *lapis calaminaris*, mixed with charcoal, in a retort, to which is joined a receiver containing ſome water, and conſequently in cloſe veſſels, where the zinc, by the help of a very ſtrong fire indeed, is ſublimed in its metallic form without burning. He alſo by the ſame method reduced into zinc the *flowers of zinc*, or *pompholix*, *cadmia of the furnace*, *tutty*, which is alſo a kind of cadmia; in a word, all matters capable of producing zinc by combination with phlogiſton.—But it is evident that ſuch operations as theſe are rather fit to ſupply proofs for chemical theory, than to be put in practice for works in great. M. Margraaf has obſerved, that the zinc which he obtained by this proceſs was leſs brittle than what is obtained from the fuſion of ores; which may proceed from its greater purity, or from its better combination with phlogiſton.

Zinc is obtained, not only in the method uſed at Goſlar above deſcribed; but is alſo extracted in great works, from *lapis calimaris* and calcined blend, by a diſtillation ſimilar to that by which M. Margraaf has eſſayed ores of zinc. The firſt work of that kind was erected in Sweden by Mr Von Swab, in the year 1738. The ore employed was a kind of blend; this ore, when calcined, powdered, and mixed with charcoal, was put into iron or ſtone retorts, and the zinc was obtained by diſtillation. In Briſtol a work is eſtabliſhed in which zinc is obtained by diſtillation *by deſcent*.

Fining of Silver.

After this digreſſion which we have now made concerning the operation in the great by which zinc and cadmia are obtained, and which we could not inſert elſewhere, becauſe of the neceſſary relation it has with the ſmelting of the Ramelſberg ore, we proceed to the other operations of the ſame ore; that is to ſay, to the *finery*, by which the ſilver is ſeparated from the lead, which are mixed together, forming what is called the *work*.

This operation differs from the *fining of eſſay*, or *in ſmall*, principally in this circumſtance, that in the latter method of fining all the litharge is abſorbed into the cupel, whereas in the former method the greateſt part of this litharge is withdrawn.

The fining in great of the work of Ramelſberg is performed in a furnace called a *reverberatory furnace*. This furnace is ſo conſtructed that the flame of wood burning in a cavity called the *fire-place*, is determined by a current of air (which is introduced through the aſh-hole, and which goes out at an opening on one ſide of that part of the furnace where the work is, that is, where the lead and ſilver are) to circulate above, and to give the convenient degree of heat, when the fire is properly managed. In this furnace a great cupel, called a *teſt*, is diſpoſed. This teſt is made of the aſhes of beech-wood, well lixivated in the uſual manner. In ſome founderies different matters are added, as ſand, ſpar, calcined gypſum, quicklime, clay. When the teſt is well prepared and dried, all the work is put at once upon the cold teſt, to the quantity of 64 quintals for one operation. Then the fire is lighted in the fire-place with faggots; but the fuſion is not urged too faſt, 1. That the teſt may have time to dry; 2. Becauſe the work of the Ramelſberg ore is allayed by the mixture of ſeveral metallic matters, which it is proper to ſeparate from it, otherwiſe they would ſpoil the litharge and the lead procured from it. Theſe metallic matters are, copper, iron, zinc, and matt. As theſe heterogeneous ſubſtances are hard and refractory, they do not melt ſo ſoon as the work, that is, as the lead and ſilver: and when the work is melted, they ſwim upon its ſurface like a ſkin, which is to be taken off. Theſe impurities are called the *ſcum* or the *firſt-waſte*. What remains forms a ſecond ſcum, which appears when the work is at its greateſt degree of heat, but before the litharge begins to form itſelf. It is a ſcoria which is to be carefully taken off. It is called the *ſecond waſte*.

When the operation is at this point, it is continued by the help of bellows, the wind of which is directed, not upon the wood or fuel, but upon the very ſurface of the metal, by means of iron-plates put for that purpoſe before the blaſt-hole, which are called *papillons*. This blaſt does not ſo much increaſe the intenſity of the fire, as it facilitates the combuſtion of the lead, and throws the litharge that is not imbibed by the teſt towards a channel, called the *litharge-way*, through which

Various proceſſes for extracting Silver.

Various proceſſes for extracting Silver.

which it flows. The litharge becomes fixed out of the furnace: the matter which is found in the middle of the largeſt pieces, and which amounts to about a half or a third of the whole, is friable, and falls into powder like ſand. This is put into barrels containing each five quintals of it; and is called *ſaleable litharge*, becauſe it is ſold in that ſtate. The other part, which remains ſolid, is called *cold litharge*, and is again melted and reduced into lead. The fuſion is called *cold fuſion*, and the lead obtained from it *cold lead*, which is good and ſaleable when the work has been well cleared from the heterogenous matters mentioned above. The teſts and cupels impregnated with litharge are added in the fuſion of the ore, as we have already related.

When two-thirds, or nearly that quantity, of the lead are converted into litharge, no more of it is formed. The ſilver then appears covered with a white ſkin, which the finers call *lightening*, and the metal *lightened* or *fined ſilver*.

The ſilver obtained by this proceſs of fining is not yet altogether pure. It ſtill contains ſome lead, frequently to the quantity of four drams in each marc or eight ounces. It is delivered to the workmen, who complete its purification by the ordinary method. This laſt operation is the refining, and the workmen employed to do it are called *refiners*. A fining of 64 quintals of work, yields from 8 to 10 merks of fined ſilver, and from 35 to 40 quintals of litharge; that is from 12 to 18 of ſaleable litharge, from 22 to 23 of cold litharge, from 20 to 22 quintals of impregnated teſt, and from 6 to 7 quintals of lead-droſs. The operation laſts from 16 to 18 hours.

§ 2. Ores containing ſilver may be divided into four kinds. 1. Pure, or thoſe which are not much compounded with other metals. 2. Galenical, in which the ſilver is mixed with much galena, or ore of lead mineraliſed by ſulphur. 3. Pyritous, in which the ſilver is mixed with the martial pyrites. 4. Cupreous, in which the ſilver is contained in copper ores. To extract the ſilver from theſe ſeveral kinds of ores, different operations are neceſſary.

Native ſilver is ſeparated from its adhering earths and ſtones by amalgamation with mercury in the manner directed for the ſeparation of gold; or by fuſion with lead, from which it may be afterwards ſeparated by cupellation.

Pure ores ſeldom require a previous calcination; but when bruiſed and cleanſed from extraneous matters, may be fuſed directly, and incorporated with a quantity of lead; unleſs they contain a large proportion of ſulphur and arſenic, in which caſe a calcination may be uſeful. The lead employed muſt be in a calcined or vitrified ſtate, which being mixed with the ore, and gradually reduced by the phlogiſton of the charcoal added to it, may be more effectually united with the ſilver of the ore, than if lead itſelf had been added, which would too quickly precipitate to the bottom of the containing veſſel or furnace. The ſilver is to be afterwards ſeparated from the lead by cupellation.

Galenical ores, eſpecially thoſe in which pyrites is intermixed, require a calcination, which ought to be performed in an oven, or reverberatory furnace. They are then to be fuſed together with ſome inflammable matter, as charcoal, by which the lead is revived, and together with the ſilver is precipitated.

Pyritous ores muſt be firſt melted, ſo as to form a matt. If the ſulphur is not ſufficient for this kind of fuſion, more ſulphurated pyrites may be added. This matt contains, beſides ſilver and ſulphur, alſo various metals, as lead, iron, and ſometimes cobalt. The matt muſt be expoſed to repeated calcination till the ſulphur is diſſipated. By theſe calcinations moſt of the iron is deſtroyed. The calcined matt is to be fuſed with litharge, and the ſilver incorporated with the revived lead; with which, and from the other imperfect metals with which it may be mixed, it muſt afterwards be ſeparated by cupellation.

The ſilver contained in cupreous ores may be obtained, either, 1. By ſeparating it from the copper itſelf, after this has been extracted along with the ſilver in the uſual manner, from the ore; or, 2. By precipitating it immediately from the other matters of the ore.

1. It may be ſeparated from the copper by two methods. One of theſe is by adding lead, and ſcorifying the imperfect metals. By this method much of the copper would be deſtroyed, and it is therefore not to be uſed unleſs the quantity of ſilver relatively to the copper be conſiderable, Another method by which ſilver may be ſeparated from copper is by eliquation; that is, by mixing the maſs of copper and ſilver with a quantity of lead, and applying ſuch a heat as ſhall be juſt ſufficient to make the lead eliquate from the copper, together with the ſilver, which being more ſtrongly diſpoſed to unite with the lead than with the copper, is thus incorporated with the former metal, and ſeparated from the latter.

2. Silver may alſo be extracted from theſe cupreous ores by precipitation. For this purpoſe, let the ore, previouſly bruiſed and cleanſed, be formed into a matt that the earthy matter may be well ſeparated. Let the matt be then fuſed with a ſtrong heat; and when the ſcoria has been removed, and the heat is diminiſhed, add to it ſome clean galena, litharge, and granulated lead. When the fire has been raiſed, and the additions well incorporated with the matt, let ſome caſt or filed iron be thrown into the liquid maſs, which being more diſpoſed than lead is to unite with ſulphur will ſeparate and precipitate the latter metal, and along with it the ſilver or gold contained in the matt. This method was introduced by Scheffer, and is practiſed at Adelfors in Smoland. In this work the proportion of the ſeveral materials is, four quintals of matt, two quintals of black copper containing ſome lead with the perfect metal, one quintal of galena one quintal of litharge, a fifth part of a quintal of granulated lead, and an equal quantity of caſt iron.

The ſilver in this, and in all other inſtances where it is united with lead, is to be afterwards ſeparated from the lead by cupellation; which proceſs is deſcribed at the articles *Eſſay of the Value of Silver*, and REFINING.

Sect. IV. *Smelting of Ores of Copper.*

§ 1. The ſmelting in great of copper ores, and even of ſeveral ores of ſilver and lead, excepting that of Ramelſberg, is performed in furnaces not eſſentially different from that already deſcribed ; but in this reſpect only, that the ſcoria and metal are not drawn out of the furnace, but flow ſpontaneouſly, as ſoon as they are melted, into receiving baſons, where the metal is freed from the ſcoria. Theſe furnaces are generally called *pierced furnaces*.

Inſtead of a light braſque, or bed of charcoal powder, under which the metal lies hid, the bottom of theſe furnaces is covered with a baſon compoſed of heavy braſque, which is a mixture of charcoal-powder and clay. In the front of the furnace, and at the bottom of the chemiſe, there is a hole, called the *eye*, through which the melted matter flows and runs along a trench or furrow, called the *trace*, into one or more receiving baſons made of earth, ſcoria, ſand, &c. There the metal is ſeparated from the ſcoria, by making it flow from theſe baſons into another lateral one. Theſe furnaces alſo are alſo called *crooked furnaces*.

Different names are given to them according to ſome difference in their conſtruction. For inſtance, thoſe which have two eyes, and two traces, through which the melted matter flows alternately into two baſons, are called *ſpectacle-furnaces*. Their greater or leſs height gives occaſion alſo to the diſtinction of *high furnaces* and *middle furnaces*.

The high furnaces are of modern invention. They were firſt introduced at Mansfield in the year 1727 ; and they are now uſed in almoſt all countries where ores are ſmelted, as in Saxony, Bohemia, Hungary, &c. Their chief advantage conſiſts in ſimplifying and diminiſhing the labour. This advantage is effected by the great height of the furnace, which allows the ore to remain there a long time before it falls down into the hotteſt part of the fire and is melted. Conſequently, it ſuffers ſucceſſively different degrees of heat ; and, before it is melted, it undergoes a roaſting which coſts nothing ; therefore the high furnaces are chiefly employed for crude fuſions ; and particularly for the ſlate-copper ore. Theſe furnaces are above 18 feet high. A too great height is attended with an inconvenience, beſides the trouble of ſupplying it with ore and fuel, which is, that the charcoal is moſtly conſumed before it gets down where the greateſt heat is required, and is then rendered incapable of maintaining a fire ſufficiently intenſe.

All the furnaces which we have mentioned are ſupplied with large bellows, moved by the arbor of a wheel, which is turned round by a current of water

The only kind of furnace for ſmelting ores where bellows are not employed, is what is called a *reverberatory furnace*. The Germans call it a *wind furnace*. It is alſo diſtinguiſhed by the name of *Engliſh furnace*, becauſe the invention of it is attributed to an Engliſh phyſician of the name of *Wright*, who was well verſed in chemiſtry ; and becauſe the uſe of it was firſt introduced, in England about the end of the laſt century, where it is much employed, as well as in ſeveral other countries, as at Konigſberg, in Norway.

The length of theſe furnaces is about 18 feet, comprehending the maſonry : their breadth is 12 feet, and their height nine feet and a half. The hearth is raiſed three feet above the level of the foundery : on one ſide is the fire-place, under which is an aſh-hole hollowed in the earth ; on the other ſide is a baſon made, which is kept covered with fire when there is occaſion : on the anterior ſide of this furnace there is a chimney, which receives the flame after it has paſſed over the mineral that is laid upon the hearth. This hearth, which is in the interior part of the furnace, is made of a clay capable of ſuſtaining the fire. The advantage of this furnace is, that bellows are not neceſſary ; and conſequently it may be conſtructed where there is no current of water, and wherever the mine happens to be. This furnace has a hole in its front, through which the ſcoria is drawn out; and a baſon, as we have ſaid, on one ſide, made with ſand, in which are oblong traces for the reception of the matt, and of the black copper, when they flow out of the furnace.

Copper is generally mineraliſed, not only by ſulphur and arſenic, but alſo by ſemimetals and pyritous matters, and is frequently mixed with other metals. As this metal has great affinity with ſulphur and arſenic, it is almoſt impoſſible to diſengage it from them entirely by roaſting : hence, in the ſmelting in great nothing is obtained by the firſt operation but a copper matt, which contains all the principles of the ore, excepting the earthy and ſtony parts, particularly when the ore is ſmelted crude and unroaſted. Afterwards this matt muſt be again roaſted and fuſed. The produce of this ſecond fuſion begins ſtill more to reſemble copper, but is not malleable. It continues mixed with almoſt all the minerals, particularly with the metals. As it is frequently of a black colour, it is always called *black copper*, when it is unmalleable, whatever its colour happens really to be.

As, of all the imperfect metals, copper is moſt difficultly burnt and ſcorified, it is again remelted ſeveral times, in order to burn and ſcorify the metallic ſubſtances mixed with it ; and this is done till the copper is perfectly pure, which is then called *red* or *refined copper*, and theſe laſt fuſions are called the *fining* and *refining* of it : red copper contains no metals but gold and ſilver, if any of theſe happened to be in the ore.

In order to avoid all theſe fuſions, it has been propoſed to treat in the humid way certain copper ores, particularly thoſe which are very pyritous. This method conſiſts in making the blue vitriol from the ore, by roaſting and lixiviating it, and in precipitating pure copper from this lixivium, which is called *cement-water*, by means of iron: but it is not much practiſed, becauſe it has been obſerved, that all the copper contained in the ore was not procured by this means.

As expence is not much regarded in ſmall eſſays and experiments, theſe fuſions are much abridged and facilitated by adding at firſt ſaline and glaſſy fluxes ; and then by refining the black copper with lead in the cupel, as gold and ſilver are done. In this method of refining, it is to be moſt carefully obſerved, that the metal be fuſed as quickly as poſſible, and expoſed to no more heat than is neceſſary, leſt it be calcined.

When the black copper contains ſome iron, but not a great

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a great deal, the lead preſently ſeparates the iron from it, and makes it riſe to the ſurface of the copper: but if the iron be in too large a proportion, it prevents the lead from uniting with the copper. Theſe two phemena depend on the ſame cauſe, which is, that lead and iron cannot unite.

Frequently copper ores contain alſo a quantity of ſilver ſufficient to make its extraction by particular proceſſes profitable. It was long before any proceſs could be thought of for this purpoſe which was not too expenſive and troubleſome: but at length it is accompliſhed by the excellent operation called *eliquation*.

The copper from which ſilver has been ſeparated by eliquation muſt be refined after this operation, as it is generally black copper from which ſilver is extracted: but even if it had not been black copper which was employed for this operation, it would require to be refined on account of a little lead it always retains. It is therefore carried to the refiner's furnace, when this operation is performed by help of bellows, the blaſt of which is thrown upon the ſurface of the melted metal. As in this refining of copper the preciſe time when it becomes pure cannot be known, becauſe ſcoria is always formed on its ſurface, it is neceſſary to uſe an eſſay-iron, the poliſhed end of which being dipt in melted copper, ſhows that this metal is pure when the copper adhering to the iron falls off as ſoon as it is dipt in cold water.

When this mark of the purity of the copper has been obſerved, its ſurface ought to be well cleaned; and as ſoon as it begins to fix, it muſt be ſprinkled with a broom or beſom dipped in cold water. The ſurface of the copper which is then fixing, being ſuddenly cooled by the water, detaches itſelf from the reſt of the metal, is taken hold of by tongs, and is thrown red hot into cold water. By again ſprinkling water on the maſs of copper, it is all of it reduced into plates which are called *roſettes*, and theſe plates are what is called *roſette-copper*.

§ 2. The copper of pyritous cupreous ore cannot be obtained without ſeveral operations, which vary according to the nature of the ores. Theſe operations are chiefly roaſtings and fuſions. By the firſt fuſion a matt is produced, which is afterwards to be roaſted; and thus the fuſions and roaſtings are to be alternately applied, till by the laſt fuſion copper is obtained. Theſe methods of treating pyritous copper ores depend on the two following facts: 1. Sulphur is more diſpoſed to unite with iron than with copper. 2. The iron of theſe ores is deſtructible by the burning ſulphur during the roaſting of the fuſion of the ores, while the copper is not injured. This fact appears from experiments mentioned by Scheffer and by Wallerius, and from the daily practice of ſmelting cuperous ores.

From theſe facts we learn, 1. That ſulphur may be employed to ſeparate and deſtroy iron mixed with copper. 2. That iron may be employed to ſeparate the ſulphur from copper, as is ſometimes done in the eſſay of ſulphurated copper-ores. 3. That by adjuſting the proportion of the iron and ſulphur to each other in the ſmelting of copper-ores, theſe two ſubſtances may be made to deſtroy each other, and to procure a ſeparation of the copper: and this adjuſtment may be effected, by adding ſulphur or ſulphureous pyrites to the copper-ore, when the quantity of ſulphur contained in this ore relatively to the iron is too ſmall; or by adding iron when the ſulphur predominates; or by roaſting by which the ſuperfluous ſulphur may be expelled, and no more left than is ſufficient for the deſtruction of the iron contained in the ore. We ſhall apply theſe principles to the following caſes.

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1. When the quantity of ſulphur and of iron in a copper ore is ſmall, and eſpecially when the iron does not too much abound, a previous roaſting will at once calcine the iron, and expel moſt of the ſulphur; ſo that by one fuſion the calcined iron may be ſcorified and black copper may be obtained. If the ſulphur has not been ſufficiently expelled, a ſecond roaſting and fuſion are requiſite; for the whole quantity of ſulphur ought not to be expelled during the firſt roaſting: but as much ought to be left as is ſufficient for the ſcorification of the calcined iron; otherwiſe this might, during the fuſion, be again revived and united with the copper.

2. If, in a copper ore, the quantity of iron be too great, relatively to the ſulphur, ſome ſulphurated pyrites, eſpecially that kind which contains copper ought to be added, that a matt may be obtained, and that the iron may be calcined and ſcorified.

3. When the quantity of ſulphur and iron is very great, that is, when the ore is very pyritous and poor it ought to be firſt formed into a matt; by which it is ſeparated from the adherent earths and ſtones, and the bulk is diminiſhed; then by repeated and alternate roaſtings and fuſions, the copper may be obtained.

4. When the quantity of ſulphur in an ore is greater than is ſufficient for the forming a matt, the ſuperfluous quantity ought to be previouſly expelled by roaſting.

The copper thus at firſt obtained is never pure, but is generally mixed with ſulphur or with iron. It is called *black copper*. This may be refined in furnaces, or on hearths.

In the former methods, to the copper when melted a ſmall quantity of lead is added, which unites with the ſulphur, and is ſcorified together with the iron, and floats upon the ſurface of the melted copper. This purification of copper by means of lead is ſimilar to the refining of ſilver by cupellation; and is founded on the property of lead, by which it is more diſpoſed to unite with ſulphur than copper is; and on a property of copper, by which it is leſs liable than any other imperfect metal to be ſcorified by lead. But as copper is alſo capable of being ſcorified by lead, this operation muſt be longer continued, and no more lead muſt be employed, than is ſufficient for the ſeparation of the ſulphur, and for the ſcorification of the iron.

The copper might alſo be purified from any remaining ſulphur by adding a ſufficient quantity of iron to engage the ſulphur. Thus Mr Scheffer found, that by adding to ſulphurated copper from $\frac{1}{20}$th to $\frac{1}{40}$th of old caſt iron, he rendered the copper pure and ductile. See his Diſſertation on the Parting of Metals amongſt the *Swediſh Memoirs* for the year 1752. In this purification, the quantity of iron added ought not to be too

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little, elſe all the ſulphur will not be ſeparated; and it ought not to be too great, elſe the ſuperfluous quantity will unite and injure the purity of the copper. The fuſion and ſcorification, with addition of lead, ſeems to be the beſt method for the laſt purification of copper.

Sect. V. *Smelting*, &c. *of Ores of Iron.*

Notwithstanding the great importance of this ſubject, and the labours of Reaumur, Swedenborgius and of ſome other authors, we have ſtill a very imperfect knowledge of the cauſes of the differences of the ſeveral kinds of ores, of the methods of ſmelting beſt adapted to theſe differences, of the cauſes of the good and bad qualities of different kinds of iron, and of the means of ſo meliorating this metal, that we may obtain tough and ductile iron from any of its ores.

Swedenborgius has very induſtriouſly and exactly deſcribed the different proceſſes now uſed in moſt parts of Europe for the ſmelting of ores of iron, for the forging of that metal, and for the converſion of it into ſteel: but we do not find that he or any other author have, by experiments and diſcoveries, contributed much to the illuſtration or to the improvement of this part of metallurgy, unleſs, perhaps, we except thoſe of Mr Reaumur, concerning the ſoftening of caſt iron by cementation with earthy ſubſtances.

The ores of iron are known to vary much in their appearance, in their contents, in their degrees of fuſibilty, in the methods neceſſary for the extraction of their contained metal, and in the qualities of the metal when extracted.

Moſt ores require to be roaſted previouſly to their fuſion; ſome more ſlightly, and others with a more violent and longer-continued fire. Thoſe which contain much ſulphur, arſenic, or vitriolic acid, require a long-continued and repeated roaſting, that the volatile matters may be expelled. Of this kind is the black-iron ore, from which the Swediſh iron is ſaid to be obtained.

Some ores require a very ſlight roaſting only, that they may be dried and rendered friable.—Such are the ores called *bog ores*, and others, which being in a calcined ſtate, and containing little ſulphureous matter, would, by a farther calcination, be rendered leſs capable of being reduced to a metallic ſtate.

The roaſting of ores of iron is performed by kindling piles, conſiſting of ſtrata of fuel and of ore placed alternately upon one another, or in furnaces ſimilar to thoſe commonly employed for the calcination of limeſtone.

Some authors adviſe the addition of a calcareous earth to ſulphureous ores during the roaſting, that the ſulphur may be abſorbed by this earth when converted into quicklime. But we may obſerve that the quicklime cannot abſorb the ſulphur or ſulphureous acid, till theſe be firſt extricated from the ore, and does therefore only prevent the diſſipation of theſe volatile matters; and, ſecondly, that the ſulphur thus united with the quicklime forms a hepar of ſulphur, which will unite with and diſſolve the ore during its fuſion, and prevent the precipitation of the metal.

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“ The next operation is the *fuſion* or *ſmelting* of the ore. This is generally performed in furnaces or towers, from 20 to 30 feet high, in the bottom of which is a baſon for the reception of the fluid metal. When the furnace is ſufficiently heated, which muſt be done at firſt very gradually, to prevent the cracking of the walls; a quantity of the ore is to be thrown in, from time to time, at the top of the furnace, along with a certain quantity of fuel and of lime-ſtone, or whatever other flux is employed. When the fuel below is conſumed by the fire excited by the wind of the bellows, the ore, together with its proportionable quantity of fuel and of flux, ſink gradually down, till they are expoſed to the greateſt heat in the furnace. There the ore and the flux are fuſed, the metallic particles are revived by the fuel, are precipitated by means of their weight through the ſcoria formed of the lighter earthy parts of the flux and of the ore, and unite in the baſon at the bottom of the furnace, forming a maſs of fluid metal covered by a glaſſy ſcoria. When a ſufficient quantity of this fluid metal is collected, which is generally twice or thrice in 24 hours, an aperture is made, through which the metal flows into a channel or groove made in a bed of ſand; and from thence into ſmaller lateral or connected channels, or other moulds. There it is cooled, becomes ſolid, and retains the forms of the channels or moulds into which it flows. The piece of iron formed in the large channel is called a *ſow* and thoſe formed in the ſmaller channels are called *pigs*. Sometimes the fluid iron is taken out of the furnace by means of ladles, and poured into moulds ready prepared, of ſand or of clay, and is thus formed into the various utenſils and inſtruments for which caſt iron is a proper material.

The *ſcoria* muſt be, from time to time, allowed to flow out, when a conſiderable quantity of it is formed through an aperture made in the front of the furnace for that purpoſe. A ſufficient quantity of it muſt, however, be always left to cover the ſurface of the melted iron, elſe the ore which would fall upon it, before the ſeparation of its metallic from its unmetallic parts, would leſſen the fluidity and injure the purity of the melted metal. This ſcoria ought to have a certain degree of fluidity; for if it be too thick, the revived metallic particles will not be able to overcome its tenacity, and collect together into drops, nor be precipitated. Accordingly, a ſcoria not ſufficiently fluid, is always found to contain much metal. If the ſcoria be too thin, the metallic particles of the ore will be precipitated before they are ſufficiently metalliſed, and ſeparated from the earthy and unmetallic parts. A due degree of fluidity is given to the ſcoria by applying a proper heat and by adding fluxes ſuited to the ore.

Some ores are fuſible without addition, and others cannot be ſmelted without the addition of ſubſtances capable of facilitating their fuſion.

The *fuſible ores* are thoſe which contain ſulphur, arſenic, or are mixed with ſome fuſible earth.

The *ores difficultly fuſible* are thoſe which contain no mixture of other ſubſtance. Such are moſt of the ores

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ores which contain iron in a ſtate nearly metallic. As iron itſelf, when purified from all heterogeneous matters, is ſcarcely fuſible without addition, ſo the metal contained in theſe purer kinds of ores cannot be eaſily extracted without the addition of ſome fuſible ſubſtance. 1. Thoſe which are mixed with ſome very refractory ſubſtance. Some of theſe refractory ores contain arſenic; but as this ſubſtance facilitates the fuſion of ores, we may preſume that their refractory quality depends upon a mixture of ſome unmetallic earth or other infuſible ſubſtance. The earth which is mixed with the common calciform ores is in conſiderable quantity; and is ſometimes calcareous, ſometimes ſiliceous, and ſometimes argillaceous.

Perhaps the fuſibility of different ores depends greatly on the degree of calcination to which the metal contained in them has been reduced; ſince we have reaſon to believe, that by a very perfect calcination, ſome metals at leaſt may be reduced to the ſtate of an earth almoſt unfuſible, and incapable of metalliſation; and ſince we know, that in every calcination and ſubſequent reduction of a given quantity of any imperfect metal, a ſenſible part of that quantity is always loſt or deſtroyed, however carefully theſe operations may have been performed. That ſome of theſe ores are already too much calcined, appears from the inſtance abovementioned of the *bog ores*, which are injured by roaſting; and even the great height of the common ſmelting furnaces, although advantageous to many ores that require much roaſting, is ſaid to be injurious to thoſe which are already too much calcined, by expoſing them to a further calcination, during their very gradual deſcent, before they arrive at the hotteſt part of the furnace, where they are fuſed.

But as too violent calcination renders ſome ores difficultly fuſible, ſo too ſlight calcination of other ores injures the purity of the metal, by leaving much of the ſulphureous or other volatile matter, which ought to have been expelled.

Various *ſubſtances are added to aſſiſt the fuſion of ores difficultly fuſible*. Theſe are, 1. *Ores* of a fuſible quality, or which, being mixed with others of a different quality, become fuſible: accordingly, in the great works for ſmelting ores of iron, two or more different kinds of ore are commonly mixed, to facilitate the fuſion, and alſo to meliorate the quality of the iron. Thus an ore yielding an iron which is brittle when hot, which quality is called *red-ſhort*, and another ore which produces iron brittle when cold, or *cold-ſhort*, are often mixed together; not, as ſometimes ſuppoſed, that theſe qualities are mutually deſtructive of each other, but that of each of them is diminiſhed in the mixed maſs of iron, as much as this maſs is larger than the part of the maſs originally poſſeſſed of that quality. Thus, if from two ſuch ores the maſs of iron obtained conſiſts of equal parts of cold-ſhort, and of red-ſhort iron, it will have both theſe qualities, but will be only half as *cold ſhort* as iron obtained ſolely from one of the ores, and half as *red-ſhort* as iron obtained only from the other ore. 2. *Earths* and *ſtones* are alſo generally added to facilitate the fuſion of iron ores. Theſe are ſuch as are fuſible, or become fuſible when mixed with the ore, or with the earth adhering to it. Authors direct that, if this earth be of an argillaceous nature, limeſtone or ſome calcareous earth ſhould be added; and that, if the adherent earth be calcareous, an argillaceous or ſiliceous earth ſhould be added; becauſe theſe two earths, though ſingly unfuſible, yet, when mixed, mutually promote the fuſion of each other: but as limeſtone is almoſt always added in the ſmelting of iron ores, and as in ſome of theſe, at leaſt, no argillaceous earth appears to be contained, we are inclined to believe that it generally facilitates the fuſion, not merely by uniting with thoſe earths, but by uniting with that part of the ore which is moſt perfectly calcined, and leaſt diſpoſed to metallification; ſince we know, that by mixing a calciform or roaſted ore of iron with calcareous earth, without any inflammable matter, theſe two ſubſtances may be totally vitrified. See *Experiments made upon quicklime and upon iron, by Mr Brandt, in the Swediſh Memoirs for the years* 1749 *and* 1751. Calcareous earth does indeed ſo powerfully facilitate the fuſion of iron ores, that it deſerves to be conſidered whether workmen do not generally uſe too great a quantity of it, in order to haſten the operation. For when the ſcoria is rendered too thin, much earthy or unmetallized matter is precipitated, and the caſt iron produced is of too vitreous a quality, and not ſufficiently approximated to its true metallic ſtate.

Some authors pretend, that a principal uſe of the addition of limeſtone in the ſmelting of iron ores is to abſorb the ſulphur, or vitriolic acid, of theſe ores: but, as we have already obſerved, a hepar of ſulphur is formed by that mixture of calcareous earth and ſulphur, which is capable of diſſolving iron in a metallic ſtate; and thus the quantity of metal obtained from an ore not ſufficiently diveſted of its ſulphur, or vitriolic acid, (which, by uniting with the fuel, is formed into a ſulphur during the ſmelting), muſt be conſiderably diminiſhed, though rendered purer, by addition of calcareous earth: hence the utility appears of previouſly expelling the ſulphur and vitriolic acid from the ore by a ſufficient roaſting. 3. The *ſcoria* of former ſmeltings is frequently added to aſſiſt the fuſion of the ore; and, when the ſcoria contains much iron, as ſometimes happens in ill-conducted operations, it alſo increaſes the quantity of metal obtained.

The quantity of theſe fuſible matters to be added varies according to the nature of the ore; but ought in general to be ſuch, that the ſcoria ſhall have its requiſite degree of thinneſs, as is mentioned above.

The *fuel* uſed in moſt parts of Europe for the ſmelting of ores of iron is charcoal. Lately, in ſeveral works in England and Scotland, iron ore has been ſmelted by means of pit-coal, previouſly reduced to cinders or *coaks*, by a kind of calcination ſimilar to the operation for converting wood into charcoal, by which the aqueous and ſulphureous parts of the coal are expelled, while only the more fixed bituminous parts are left behind. In France, pit-coal not calcined has been tried for this purpoſe, but unſucceſsfully. The uſe of *peat* has alſo been introduced in ſome parts of England.

The quality of the iron depends conſiderably upon the quality and alſo upon the quantity of the fuel employed. Charcoal is fitter than coaks for producing

ducing an iron capable of being rendered malleable by forging.

The quantity of fuel, or the intenſity of the heat, muſt be ſuited to the greater or leſs fuſibility of the ore. Sulphureous, and other ores eaſily fuſible, require leſs fuel than ores difficultly fuſible. In general, if the *quantity of fuel be too ſmall*, and the heat not ſufficiently intenſe, all the iron will not be reduced, and much of it will remain in the ſcoria, which will not be ſufficiently thin. This defect of fuel may be known by the blackneſs and compactneſs of the ſcoria; by the qualities of the iron obtained, which in this caſe is hard, white, light, intermixed with ſcoria, ſmooth in its texture, without ſcales or grains, rough and convex in its ſurface, and liable to great loſs of weight by being forged; and, laſtly, it may be known by obſerving the colour and appearance of the drops of metal falling down from the ſmelted ore, and of the ſcoria upon the furnace of the fluid metal, both which are darker coloured than when more fuel is uſed. When the *quantity of the fuel is ſufficiently large*, and the heat is intenſe enough, the iron is darker coloured, denſer, more tenacious, contains leſs ſcoria, and is therefore leſs fuſible, and loſes leſs of its weight by being forged. Its ſurface is alſo ſmoother and ſomewhat concave; and its texture is generally granulated. The ſcoria, in this caſe, is of a lighter colour, and leſs denſe. The drops falling down from the ſmelted ore and the liquid ſcoria in the furnace appear hotter and of a brighter colour. When the quantity of fuel is too great, and the heat too intenſe, the iron will appear to have a ſtill darker colour, and more conſpicuous grains or plates, and the ſcoria will be lighter, whiter, and more ſpongy. The drops falling from this ſmelted ore, and the fluid ſcoria will appear to a perſon looking into the furnace through the blaſt-hole to be very white and ſhining hot. The quantity of charcoal neceſſary to produce five hundred weight of iron, when the ore is rich, the furnace well contrived, and the operation ſkilfully conducted, is computed to be about 40 cubic feet; but is much more in contrary circumſtances.

The *time during which the fluid metal ought to be kept in fuſion* before it is allowed to flow out of the furnace, muſt alſo be attended to. How long that time is, and whether it ought not to vary according to the qualities of ores and other circumſtances, we cannot determine. In ſome works the metal is allowed to flow out of the furnace every ſix or eight, and in others only every 10 or 12, hours. Some workmen imagine, that a conſiderable time is neceſſary for the concoction of the metal. This is certain, that the iron undergoes ſome change by being kept in a fluid ſtate; and that if its fuſion be prolonged much beyond the uſual time, it is rendered leſs fluid, and alſo its coheſion, when it becomes cold, is thereby greatly diminiſhed. The marquis de Courtivron ſays, that the coheſion may be reſtored to iron in this ſtate by adding to it ſome vitreſcible earth, which he conſiders as one of the conſtituent parts of iron, and which he thinks is deſtroyed by the fuſion too long continued. That the fuſibility of caſt-iron does depend on an admixture of ſome vitreſcible earth, appears probable from the great quantity of ſcoria forced out of iron during its converſion into malleable or forged iron, and from the loſs of fuſibility which it ſuffers nearly in proportion to its loſs of ſcoria. The quantity of iron daily obtained from ſuch a furnace as is above deſcribed, is from two to five tons in 24 hours, according to the richneſs and fuſibility of the ore, to the conſtruction of the furnace, to the adjuſtment of the due quantity of flux and of fuel, and to the ſkill employed in conducting the operation.

The *quality of the iron* is judged of by obſerving the appearances during its flowing from the furnace, and when it is fixed and cold. If the fluid iron, while it flows, emits many and large ſparkles; if many brown ſpots appear on it while it is yet red hot; if, when it is fixed and cold, its corners and edges are thick and rough, and its ſurface is ſpotted; it is known to have a red-ſhort quality. If, in flowing, the iron ſeems covered with a thin glaſſy cruſt, and if, when cold, its texture be whitiſh, it is believed to be cold-ſhort. Mr Reaumur ſays, that dark-coloured caſt iron is more impure than that which is white. The marquis de Courtivron is of a contrary opinion. But no certain rules for judging of the quality of iron before it be forged can be given. From brittle caſt iron, ſometimes ductile forged iron is produced. Caſt-iron with brilliant plates and points, when forged, becomes ſometimes red-ſhort and ſometimes cold-ſhort. Large ſhining plates, large cavities called *eyes*, want of ſufficient denſity, are almoſt certain marks of bad iron; but whether it will be cold or red ſhort cannot be affirmed till it be forged. Whiteneſs of colour, brittleneſs, cloſeneſs of texture, and hardneſs, are given to almoſt any caſt iron by ſudden cooling; and we may obſerve, that in general the whiter the metal is, the harder it is alſo, whether theſe properties proceed from the quality of the iron, or from ſudden cooling; and that, therefore, the darker-coloured iron is fitter for being caſt into moulds, becauſe it is capable in ſome meaſure of being filed and poliſhed, eſpecially after it has been expoſed during ſeveral hours to a red-heat in a reveberatory furnace, and very gradually cooled. This operation, called by the workmen *annealing*, changes the texture of the metal, renders it ſofter and more capable of being filed than before, and alſo conſiderably leſs brittle.

Mr Reaumur found, that by cementing caſt iron with abſorbent earths in a red-heat, the metal may be rendered ſofter, tougher, and conſequently a fit material for many utenſils formerly made of forged iron. Whether cementation with abſorbent earths gives to caſt iron a greater degree of theſe properties than the annealing commonly practiſed, has not been yet determined.

In Navarre, and in ſome of the ſouthern parts of France, iron-ore is ſmelted in furnaces much ſmaller, and of a very different conſtruction from thoſe above deſcribed. A furnace of this kind conſiſts of a wide-mouthed copper-caldron, the inner ſurface of which is lined with maſonry a foot thick. The mouth of this caldron is nearly of an oval or elliptic form. The ſpace or cavity contained by the maſonry is the furnace in which the ore is ſmelted. The depth of this cavity is equal to two feet and a half: the larger diameter of the oval mouth of the cavity is about eight feet, and its ſmaller diameter is about ſix feet: the ſpace of the furnace is gradually contracted towards the bottom, the greateſt diameter of which does not exceed ſix feet: eighteen inches above the bottom is a cylindrical channel in one of the longer ſides of the caldron and maſonry, through which the nozzle of the bellows paſſes. This channel, and alſo the bellows pipe, are ſo inclined, that the wind is directed towards the loweſt point of the oppoſite ſide of the furnace. Another cylindrical channel is in one of the ſhorter ſides of the furnace, at the height of a few inches from the bottom, which is generally kept cloſed, and is opened occaſionally to give paſſage to the ſcoria: and above this is a third channel in the ſame ſide of the furnace, through which an iron inſtrument is occaſionnally introduced to ſtir the fluid metal, and to aſſiſt, as is ſaid, the ſeparation of the ſcoria from it. The greateſt height of this channel is at its external aperture on the outſide of the furnace, and its ſmaller height is at its internal aperture; ſo that the inſtrument may be directed towards the bottom of the furnace; but the ſecond channel below it has a contrary inclination, that, when an opening is made, the ſcoria may flow out of the furnace into a baſon placed for its reception. When the furnace is heated ſufficiently, the workmen begin to throw into it alternate changes of charcoal and of ore previouſly roaſted. They take care to throw the charcoal chiefly on that ſide at which the wind enters, and the ore at the oppoſite ſide. At the end of about four hours, a maſs of iron is collected at the bottom of the furnace, which is generally about 600 weight; the bellows are then ſtopt; and then the maſs of iron is become ſolid, the workmen raiſe it from the bottom of the furnace, and place it, while yet ſoft, under a large hammer, where it is forged. The iron produced in theſe furnances is of the beſt quality; the quantity is alſo very conſiderable, in proportion to the quantity of ore, and to the quantity of fuel employed. In theſe furnaces no limeſtone or other ſubſtance is uſed to facilitate the fuſion of the ore. We ſhould receive much inſtruction concerning the ſmelting of iron-ore, if we knew upon what part of the proceſs, or circumſtance, the excellence of the iron obtained in theſe furnaces depends; whether on the quality of the ore; on the diſuſe of any kind of flux, by which the proportion of vitreous or earthy matter, intermixed with the metallic particles, is diminiſhed; on the forging while the iron is yet ſoft and hot, as the Marquis de Courtivron thinks; or on ſome other cauſe, not obſerved.

The iron thus produced by ſmelting ores is very far from being a pure metal; and though its fuſibility renders it very uſeful for the formation of cannon, pots, and a great variety of utenſils, yet it wants the ſtrength, toughneſs, and malleability, which it is capable of receiving by further operations.

Caſt-iron ſeems to contain a large quantity of vitreous or earthy matter mixed with the pure iron; which matter is probably the chief cauſe of its fuſibility, brittleneſs, hardneſs, and other properties by which it differs from forged iron. The ſulphur, arſenic, and other impurities of the ore, which are ſometimes contained in caſt-iron, are probably only accidental, and may be the cauſes of the red-ſhort quality, and of other properties of certain kinds of iron: but the earthy matter abovementioned ſeems principally to diſtinguiſh caſt-iron from forged or malleable iron; for, firſt, by depriving the former of this earthy matter, it is rendered malleable, as in the common proceſs hereafter to be deſcribed; and, ſecondly, by fuſing malleable iron with earthy and vitreſcible matters, it loſes its malleability, and is reſtored to the ſtate and properties of caſt-iron.

The earthy vitreous matter contained in caſt-iron conſiſts probably of ſome of the ferruginous earth or calx of the ore not ſufficiently metalliſed, and alſo of ſome unmetallic earth. Perhaps it is only a part of the ſcoria which adheres to, and is precipitated with, the metallic particles, from which it is more and more ſeparated, as the heat applied is more intenſe, and as the fuſion is longer continued.

To ſeparate theſe impurities from caſt-iron, and to unite the metallic parts more cloſely and compactly, and thus to give it the ductility and tenacity which render this metal more uſeful than any other, are the effects produced by the following operations.

The firſt of theſe operations is a fuſion of the iron, by which much of its impurities is ſeparated in form of ſcoria; and by the ſecond operation, a further and more complete ſeparation of theſe impurities, and alſo a cloſer compaction of the metallic particles, are effected by the application of mechanical force or preſſure, by means of large hammers.

Some differences in the conſtruction of the forge or furnace, in which the *fuſion* or *refining of caſt-iron* is performed, in the method of conducting the operation, and in other circumſtances, are obſerved to occur in different places. We ſhall deſcribe from Swedenborgius the *German method*.

The fuſion of the caſt-iron, which is to be rendered malleable, is performed upon the hearth of a forge ſimilar to that uſed by blackſmiths: at one ſide of this hearth is formed a cavity or fire-place, which is intended to contain the fuel and the iron to be melted: this fire-place is 20 inches long, 18 inches broad, and 12 or 14 inches deep: it is bounded on three ſides by three plates of caſt-iron placed upright; and on the fourth ſide, which is the front, or that part neareſt to which the workman ſtand, by a large forge-hammer, through the eye of which the ſcoria is at certain times allowed to flow. The floor alſo of the fire-place is another caſt iron plate. The thickneſs of theſe plates is from two to four inches. One of the upright ſide-plates reſts againſt a wall, in an apertures through which a copper-tube, called the *tuyere*, is luted with clay. This tube is a kind of caſe or covering for the pipe of a pair of bellows placed behind the wall, and its direction is therefore parallel to that of the bellows-pipe; but it advances about half a foot further than this pipe into the fire-place; and thus gives greater force to the air, which it keeps concentrated, or prevents the divergency of the air till it is required to act. The tube reſts upon the edge of the ſide-plate which leans againſt the wall, nearer to the back-part than to the front of the fire-place; and in ſuch an oblique direction, that the wind ſhall be impelled towards the furtheſt part of the floor of the fire-place, or where this floor is interſected by the oppoſite ſide-plate. The obliquity of the tuyere ought to vary according to the quality of the iron: and therefore, in every operation, it may be ſhifted till its proper poſition is found. The more nearly its direction approaches

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proaches to a horizontal plane, the more intenſe is the heat; but a larger quantity of fuel is conſumed than is even proportional to the increaſe of heat, becauſe the flame is not then ſo well confined. When the iron is eaſily fuſible, great heat is not required: the tuyere may then decline conſiderably from the horizontal plane, and thus fuel may be ſaved. This tuyere, tho' made of copper, a metal more eaſily fuſible than iron, is preſerved from fuſion by the conſtant paſſage of cold air through it. It muſt be carefully kept open, and cleanſed from the ſcoria, which would be apt to block up its cavity, by which not only the heat would be too much diminiſhed for the ſucceſs of the operation, but the tube itſelf would be melted.

To prepare for the fuſion, a quantity of ſcoria of a former operation is thrown into the fire-place, till one third-part of this be full; and the remaining two thirds of the fire-place are to be filled with ſmaller ſcoria, coal-duſt, and ſparks ejected from hot iron.—Theſe matters, being fuſible, form a bath for the reception of the iron when melted. Upon this bed of ſcoria, the maſs of caſt iron to be melted is placed; ſo that one end of it ſhall be within the fire-place, oppoſite to the tuyere, and at the diſtance of about four or five inches from its aperture; and the other end ſhall ſtand without the fire-place, to be puſhed in, as the former is melted. The upper ſide of the maſs of iron ought to be in the ſame horizontal plane as the upper part of the orifice of the tuyere, that the wind may, by means of the obliquity of its courſe, ſtrike upon and paſs along the under-ſide of the maſs; but if the iron be difficultly fuſible, the tuyere is to be diſpoſed more horizontally, ſo that the wind ſhall ſtrike directly upon the maſs of iron; and that one part of the blaſt ſhall graze along the upper ſurface, and the other part along the under ſurface of the iron. The maſs of iron weighs generally from 200 to 400 pounds. Sometimes two or three ſmaller maſſes are put one above another, ſo as not to touch. When theſe are of different qualities, the cold-ſhort piece is placed undermoſt, that being more unfuſible than the red-ſhort. The iron being placed, charcoal-powder is thrown on both ſides, and coals are accumulated above, ſo as to cover entirely the iron.

The coals are then to be kindled, and the bellows are made to blow, at firſt ſlowly, and afterwards with more and more force. The iron is gradually liquefied, and flows down in drops through the melted ſcoria to the bottom of the fire-place; during which the workmen frequently turn the iron, ſo that the end oppoſed to the blaſt of wind may be equally expoſed to heat, and uniformly fuſed. While the coals are conſumed, more are thrown on, ſo that the whole may be kept quite covered. During the operation, a workman frequently ſounds the bottoms and corners of the fire-place by means of a bar or poker, raiſes up any maſs of metal which he finds adhering to theſe, and expoſes them to the greateſt heat, that they may be more perfectly fuſed.

When all the iron is fuſed, no more coals are to be added; but the melted maſs is to remain half uncovered for ſome time; during which the iron boils and bubbles, and its ſurface ſwells and riſes higher and higher. When the iron has riſen as high as the upper edge of the fire-place, the coals upon its ſurface

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muſt be removed; and by thus expoſing it to cold air, its ebullition and ſwelling ſubſide. In this ſtate, or coction, the iron is kept during half an hour or more, by adding occaſionally pieces of good coal, which maintain a ſufficient heat, without covering entirely the ſurface of the maſs. During this coction, the workmen allow the orifice of the tuyere to be half ſtopped up by the ſcoria, that the air may not blow upon the iron with all its force, by which it would be too much cooled. Accordingly, when they think that the coction has continued ſufficiently long, they clear the paſſage of the tuyere, and the maſs is ſoon cooled by the cold air. At the ſame time alſo they open a paſſage in the eye of the hammer placed in the front of the fire-place, through which ſome of the ſcoria is allowed to flow out. When the iron has become ſolid, the bellows are ſtopt, the coals are removed, and the maſs is left during an hour; and then the workmen raiſe it from the fire-place, turn it upſide down, and proceed to the ſecond coction or fuſion of the iron.

From this ſecond operation, the maſs is to be ſo placed, that one part of it ſhall reſt upon the tuyere, and the other upon the ſcoria remaining in the fire-place. This ſcoria is to be diſpoſed in an oblique direction parallel to the tuyere, by which means the wind of the bellows is obliged to paſs along the under ſide of the maſs of iron. About the ſides of the maſs, charcoal-powder and burnt aſhes are thrown; but towards the tuyere, dry and entire pieces of coals are placed, to maintain the fire. When theſe are kindled, more coals are added, and the fire is gradually excited. The workman attends to the direction of the flame, that it paſs equally along the under ſurface of the iron, quite to the further extremity, and that it do not eſcape at the ſides, nor be reverberated back towards the tuyere, by which this copper tube might be melted. During this fuſion, pieces of iron are apt to be ſeparated from the maſs, and to fall down unfuſed to the bottom and corners of the fire-place. Theſe are carefully to be ſearched for, and expoſed to the greateſt heat till they are melted. When the whole maſs is thus brought into perfect fuſion, the coals are removed; and the wind blowing on its ſurface, whirls and diſſipates the ſmall remaining pieces of ſcoria and ſparks thrown out from the fluid iron. This jet of fire continues about ſeven or eight minutes, and the whole operation about two hours. In this ſecond fuſion the ſcoria is to be thrice removed, by opening a paſſage through the eye of the hammer. The firſt time of removing the ſcoria is about 20 minutes from the kindling of the fire, the ſecond time is about 40 minutes after the firſt, and the third time is near the end of the operation.

The maſs is then removed from the hearth, and put upon the ground of the forge, where it is cleanſed from ſcoria, and beat into a more uniform ſhape. It is then placed on an anvil, where, by being forged, it receives a form nearly cubical. This maſs is to be divided into five, ſix, or more pieces, by means of a wedge; and theſe are to be heated and forged till they are reduced to the form of the bars commonly ſold.

In ſome forges, the iron is fuſed only once, and in others it ſuffers three fuſions, by which it is ſaid to be rendered

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rendered very pure. Where only one fuſion is practiſed, it is called the *French method*. In this, no greater quantity of iron is fuſed at once than is ſufficient to make one bar. The fire-place is of conſiderably leſs dimenſions, and eſpecially is leſs deep, than in the German method above deſcribed. The fire is alſo more intenſe, and the proportion of fuel conſumed to the iron is greater. The iron, when melted, is not kept in a ſtate of ebullition as is above deſcribed; but this ebullition is prevented by ſtirring the fluid maſs with an iron bar, till it is coagulated, and becomes ſolid.

By theſe operations, fuſion and forging, the iron loſes about $\frac{3}{15}$ parts of its former weight, ſometimes more and ſometimes leſs, according to the quality of the caſt-iron employed; it is purified from the vitreous and earthy parts which were intermixed with it, its metallic particles are more cloſely compacted, its texture is changed, and it is rendered more denſe, ſoft, and malleable, tough, and difficultly fuſible.

The degrees, however, of theſe qualities vary much in different kinds of iron. Thus ſome iron is tough and malleable, both when it is hot and when it is cold. This is the beſt and moſt uſeful iron. It may be known generally by the equable ſurface of the forged bar, which is free from tranſverſe fiſſures or cracks in the edges, and by a clear, white, ſmall-grained, or rather fibrous texture. Another kind is tough when it is heated, but brittle when it is cold. This is called *cold-ſhort* iron: and is generally known by a texture conſiſting of large, ſhining plates, without any fibres. It is leſs liable to ruſt than other iron. A third kind of iron, called *red ſhort*, is brittle when hot, and malleable when cold. On the ſurface and edges of the bars of this kind of iron, tranſverſe cracks or fiſſures may be ſeen; and its internal colour is dull and dark. It is very liable to ruſt. Laſtly, ſome iron is brittle both when hot and when cold.

Moſt authors agree, that the red-ſhort quality of iron proceeds from ſome ſulphur or vitriolic acid being contained in it, becauſe ſulphur is known to produce this effect when added to iron, and becauſe the iron obtained from pyritous and other ſulphurated ores has generally this quality.

The cauſe of the cold-ſhort quality of iron is not ſo well aſcertained. Some imagine, that it proceeds from a mixture of arſenic or of antimony. But this opinion ſeems to be improbable, when we conſider that theſe metallic ſubſtances may in a great meaſure be diſſipated by roaſting, whereas the ores which yield a cold-ſhort iron are injured by much roaſting; that no arſenic or antimony are obſervable in moſt, if in any, of theſe ores; and laſtly, that theſe ſemimetals would render the iron brittle both when hot and when cold. Cramer and other authors impute this vicious quality to a mixture of unmetallic earth or vitreous matter; and affirm, that it may be deſtroyed by cementation with phlogiſton, and by forging. And laſtly, others aſcribe the cold-ſhort quality of iron to a defect of phlogiſton, or, as Swedenborgius ſays, of ſulphur. To aſcertain the cauſes of the bad qualities of iron, and to diſcover practical remedies, are ſtill deſiderata in metallurgy.

In one bar frequently two or more different kinds of iron may be obſerved, which run all along its whole length; and ſcarcely a bar is ever found of entirely pure and homogeneous iron. This difference probably proceeds from the practice we have mentioned of mixing different kinds of ores together, in the ſmelting; and alſo from the practice of mixing two or more pigs, of caſt iron of different qualities in the finery of theſe; by which means, the red-ſhort and cold-ſhort qualities of the different kinds are not, as we have already remarked, mutually counteracted or deſtroyed by each other, but each of theſe qualities is diminiſhed in the mixed maſs of iron, as much as this maſs is larger than the part of the maſs originally poſſeſſed of that quality: that is, if equal parts of red-ſhort and of cold-ſhot iron be mixed together, the mixed maſs will be only half as red-ſhort as the former part, and half as cold-ſhort as the latter. For theſe different kinds of iron ſeem as if they were only capable of being interwoven and diffuſed through each other, but not of being intimately united or combined.

The quality of forged iron may be known by the texture which appears on breaking a bar. The beſt and tougheſt iron is that which has the moſt fibrous texture, and is of a clear greyiſh colour. This fibrous appearance is given by the reſiſtance which the particles of the iron make to their rupture. The next beſt iron is that whoſe texture conſiſts of clear, whitiſh, ſmall grains, intermixed with fibres. Theſe two kinds are malleable, both when hot and when cold, and have great tenacity. *Cold-ſhort iron* is known by a texture conſiſting of large, ſhining plates, without fibres: and *red-ſhort iron* is diſtinguiſhed by its dark dull colour, and by the tranſverſe cracks and fiſſures on the ſurface and edges of the bars. The quality of iron may be much improved by violent compreſſion, as by forging and rolling; eſpecially when it is not long expoſed to too violent heat, which is known to injure, and at length to deſtroy, its metallic properties.

For the converſion of iron into *ſteel*, ſee the article Steel.

Sect. VI. *Of the Smelting of Tin Ores.*

The tin-ores commonly ſmelted are thoſe which conſiſt of calx of tin combined with calx of arſenic and ſometimes with calx of iron. Theſe are either pure, as the tin-grains, or intermixed with ſpars, ſtones, pyrites, ores of copper, iron, or of other metals.

The impure ores muſt be cleanſed as much as is poſſible from all heterogeneous matters. This cleanſing is more neceſſary in ores of tin than of any other metal; becauſe in the ſmelting of tin-ores a leſs intenſe heat muſt be given than is ſufficient for the ſcorification of earthy matters, leſt the tin be calcined. Tin-ores previouſly bruiſed may be cleanſed by waſhing, for which operation their great weight and hardneſs render them well adapted. If they be intermixed with very hard ſtones or ferruginous ores, a ſlight roaſting will render theſe impure matters more friable, and conſequently fitter to be ſeparated from the tin-ores. Sometimes theſe operations, the roaſting, contuſion, and lotion, muſt be repeated. By roaſting, the ferruginous particles are ſo far revived, that they may be ſeparated by magnets.

Smelting of Ores of Lead.

The ore, thus cleanſed from adhering heterogeneous matters, is to be roaſted in an oven or reverberatory furnace, with a fire rather intenſe than long continued; during which it muſt be frequently ſtirred to prevent its fuſion. By this operation, the arſenic is expelled, and in ſome works is collected in chambers built purpoſely above the calcining furnace.

Laſtly, the ore cleanſed and roaſted is to be fuſed, and reduced to a metallic ſtate. In this fuſion, attention muſt be given to the following particulars. 1. No more heat is to be applied than is ſufficient for the reduction of the ore; becauſe this metal is fuſible with very little heat, and is very eaſily calcinable. 2. To prevent this calcination of the reduced metal, a larger quantity of charcoal is uſed in this than in moſt other fuſions. 3. The ſcoria muſt be frequently removed, leſt ſome of the tin ſhould be involved in it; and the melted metal muſt be covered with charcoal powder, to prevent the calcination of its ſurface. 4. No flux or other ſubſtance, excepting the ſcoria of former ſmeltings which contains ſome tin, are to be added, to facilitate the fuſion.

Sect. VII. *Smelting of Ores of Lead.*

Ores of lead are either pure, that is, containing no mixture of other metal; or they are mixed with ſilver, copper, or pyrites. The methods of treating ores of lead containing ſilver and copper, are deſcribed in the ſections of *Smelting of Ores of Silver* and *of Copper;* and in the former of theſe an inſtance is given of the method of ſmelting the ore of Ramelſberg, which contains all theſe three metals.

Pure ores of lead, and thoſe which contain ſo ſmall a quantity only of ſilver as not to compenſate for the expence of extracting the nobler metal, may be ſmelted in furnaces, and by operations ſimilar to thoſe uſed at Ramelſberg, or in the following methods. 1. From the lead-ore of Willach in Carinthia, a great part of the lead is obtained by a kind of eliquation, during the roaſting of the ore. For this purpoſe, the ore is thrown upon ſeveral ſtrata or layers of wood, placed in a calcining or reverberatory furnace. By kindling this wood, a great part of the lead flows out of the ore, through the layers of fuel, into a baſon placed for its reception. The ore which is thus roaſted is beat into ſmaller pieces, and expoſed to a ſecond operation ſimilar to the former, by which more metal is eliquated; and the remaining ore is afterwards ground, waſhed, and ſmelted, in the ordinary method.

The lead of Willach is the pureſt of any known, Schlutter aſcribes its great purity to the method uſed in extracting it, by which the moſt fuſible, and conſequently the pureſt part of the contained lead, is ſeparated from any leſs fuſible metal which happens to be mixed with it, and which remains in the roaſted ore. This method requires a very large quantity of wood.

2. In England, lead ores are ſmelted either upon a hearth, or in a reverberatory furnace called *a cupel*.

In the firſt of theſe methods, charcoal is employed as fuel, and the fire is excited by bellows. Small quantities of fuel and of ore are thrown alternately and frequently upon the hearth. The fuſion is very quickly effected: and the lead flows from the hearth as faſt as it is ſeparated from the ore.

Smelting of Ores of Semi-metals.

3. In the ſecond method practiſed in England, pit-coal is uſed as fuel. The ore is melted by means of the flame paſſing over its ſurface; its ſulphur is burnt and diſſipated, while the metal is ſeparated from the ſcoria, and collected at the bottom of the furnace. When the ore is well cleanſed and pure, no addition is requiſite; but when it is mixed with calcareous or earthy matrix, a kind of fluor or fuſible ſpar found in the mines is generally added to render the ſcoria more fluid, and thereby to aſſiſt the precipitation of the metal. When the fuſion has been continued about eight hours, a paſſage in the ſide of the furnace is opened, through which the liquid lead flows into an iron ciſtern. But immediately before the lead is allowed to flow out of the furnace, the workmen throw upon the liquid maſs a quantity of ſlacked quicklime, which renders the ſcoria ſo thick and tenacious. that it may be drawn out of the furnace by rakes. Schlutter mentions this addition of quicklime in the ſmelting of lead ores in England, but thinks that it is intended to facilitate the fuſion of the ores; whereas it really has a contrary effect, and is never added till near the end of the operation, when the ſcoria is to be raked from the furnace of the metal.

Sect. VIII. *Of the Smelting of Ores of Semimetals.*

Antimony is obtained by a kind of eliquation from the minerals containing it, as is deſcribed in the article Antimony; and the regulus of antimony is procured from antimony, by the proceſſes deſcribed in the ſame article, and in the article *Regulus of Antimony*.

Arſenic, *ſaffre*, and *biſmuth*, are obtained generally from one ore, namely, that called *cobalt*. The arſenic of the ore is ſeparated by roaſting, and adheres to the internal ſurface of a chimney, which is extended horizontally about 200 or 300 feet in length, and in the ſides of which are ſeveral doors, by means of which the arſenic, when the operation is finiſhed, may be ſwept out and collected. Theſe chimneys are generally bent in a zig-zag direction, that they may better retard and ſtop the arſenical flowers. Theſe flowers are of various colours, white, grey, red, yellow, according to the quantity of ſulphur or other impurity with which they happen to be mixed. They are afterwards purified by repeated ſublimations; while ſome alkaline or other ſubſtances are added to detain the ſulphur, and to aſſiſt the purification.

In the ſame roaſting of the ore by which the arſenic is expelled, the biſmuth, or at leaſt the greateſt part of this ſemimetal which is contained in the ore, being very fuſible, and having no diſpoſition to unite with the regulus of cobalt, which remains in the ore, is ſeparated by eliquation.

The remaining part of the roaſted ore conſiſts chiefly of calx of regulus of cobalt, which not being volatile, as the arſenic is, nor ſo eaſily fuſible as biſmuth is, has been neither volatilized nor melted. It contains alſo ſome biſmuth, and a ſmall quantity of arſenic, together with any ſilver or other fixed metal which happened to be contained in the ore. This roaſted ore being reduced to a fine powder, and mixed with three or four times its weight of fine ſand, is the powder called *ſaffre* or *zaffre*. Or the roaſted ore is ſometimes fuſed with about thrice its quantity of pure ſand and as much pure pot-aſh, by which a blue glaſs, called *ſmalt*, is produced; and a metallic maſs, called *ſpeiſs*, is collected at the bottom of the veſſel in which the matters are fuſed. The metallic maſs or ſpeiſs is compoſed of very different ſubſtances, according to the contents of the ore and the methods of treating it. The matters which it contains at different times are, nickel, regulus of cobalt, biſmuth, arſenic, ſulphur, copper, and ſilver.

See Zaffre.

See Smalt.

Biſmuth is ſeldom procured from any other ores but that of cobalt. It might, however be extracted from its proper ores, if a ſufficient quantity of theſe were found, by the ſame method by which it is obtained from cobalt, namely, by eliquation.

Mercury, when native, and inveloped in much earthy or other matter, from which it cannot be ſeparated merely by waſhing, is diſtilled either by aſcent or by deſcent. When it is mineraliſed by ſulphur, that is when it is contained in cinnabar, ſome intermediate ſubſtance, as quicklime or iron, muſt be added in the diſtillation, to diſengage it from the ſulphur.

The rich ore of Almaden in Spain is a cinnabar, with which a calcareous ſtone happens to be ſo blended, that no addition is required to diſengage the mercury from the ſulphur. The diſtillation is there performed in a furnace conſiſting of two cavities, one of which is placed above another. The lower cavity is the fire-place, and contains the fuel, reſting upon a grate, through the bars of which the air enters, maintains the fire and paſſes into a chimney, placed at one ſide of the fire-place immediately above the door thro' which fuel is to be introduced. The roof of this fire-place, which is vaulted and pierced with ſeveral holes, is alſo the floor of the upper cavity. Into this upper cavity, the mineral from which mercury is to be diſtilled is introduced, through a door in one of the ſides of the furnace. In the oppoſite wall of this cavity are eight openings, all at the ſame height. To each of theſe openings is adapted a file of aludels connected and luted together, extending 60 feet in length. Theſe aludels, which are earthen veſſels open at each end, and wider in the middle than at either extremity, are ſupported upon an inclined terras; and the aludel of each file, that is moſt diſtant from the furnace, terminates in a chamber built of bricks, which has two doors and two chimneys.

When the upper cavity is filled ſufficiently with the mineral, a fire is made below, which is continued during 12 or 14 hours. The heat is communicated thro' the holes of the vaulted roof of the fire-place to the mineral in the upper cavity, by which means the mercury is volatiliſed, and its vapour paſſes into the aludels, where much of it is condenſed and the reſt is diſcharged into the brick chamber, in which it circulates till it alſo is condenſed. If any air or ſmoke paſſes through the aludels along with the vapour of the mercury, they eſcape through the two chimneys of the chamber. Three days after the operation, when the apparatus is ſufficiently cooled, the aludels are unluted, the doors of the chamber are opened, and the mercury is collected.

METAMORPHOSIS, in general, denotes the changing of ſomething into a different form; in which ſenſe it includes the transformation of inſects, as well as the mythological changes related by the ancient poets.

Mythological metamorphoſes were held to be of two kinds, apparent and real: thus, that of Jupiter into a bull, was only apparent; whereas that of Lycaon into a wolf, was ſuppoſed to be real.

Moſt of the ancient metamorphoſes include ſome allegorical meaning, relating either to phyſics or morality: ſome authors are even of opinion that a great part of the ancient philoſophy is couched under them; and Lord Bacon and Dr Hook have attempted to unriddle ſeveral of them.

METAPHOR, in rhetoric. See ORATORY, nº 50.

METAPHOR *and Allegory*, in poetry.—A metaphor differs from a ſimile, in form only, not in ſubſtance: in a ſimile the two ſubjects are kept diſtinct in the expreſſion, as well as in the thought; in a metaphor, the two ſubjects are kept diſtinct in the thought only, not in the expreſſion. A hero reſembles a lion, and upon that reſemblance many ſimilies have been raiſed by Homer and other poets. But inſtead of reſembling a lion, let us take the aid of the imagination, and feign or figure the hero to be a lion, by that variation the ſimile is converted into a metaphor; which is carried on by deſcribing all the qualities of a lion that reſemble thoſe of the hero. The fundamental pleaſure here, that of reſemblance, belongs to the thought. An additional pleaſure ariſes from the expreſſion: the poet, by figuring his hero to be a lion, goes on to deſcribe the lion in appearance, but in reality the hero; and his deſcription is peculiarly beautiful, by expreſſing the virtues and qualities of the hero in new terms, which, properly ſpeaking, belong not to him, but to the lion. This will better be underſtood by examples. A family connected with a common parent, reſembles a tree, the trunk and branches of which are connected with a common root: but let us ſuppoſe, that a family is figured, not barely to be like a tree, but to be a tree; and then the ſimile will be converted into a metaphor, in the following manner:

Edward's ſev'n ſons, whereof thyſelf art one,
Were ſev'n fair branches ſpringing from one root;
Some of theſe branches by the deſt'nies cut:
But Thomas, my dear lord, my life, my Glo'ſter,
One flouriſhing branch of his moſt royal root,
Is hack'd down, and his ſummer-leaves all faded,
By Envy's hand and Murder's bloody axe.
Richard II. *act* i. *ſc.* 2.

Figuring human life to be a voyage at ſea:

There is a tide in the affairs of men,
Which, taken at the flood, leads on to Fortune:

Omitted, all the voyage of their life
Is bound in ſhallows and in miſeries.
On ſuch a full ſea are we now afloat;
And we muſt take the current when it ſerves,
Or loſe our ventures. *Julius Cæſar, act* iv. *ſc.* 5.

Figuring glory and honour to be a garland of flowers:

Hotſpur.————————Wou'd to heav'n,
Thy name in arms were now as great as mine!
Pr. Henry. I'll make it greater ere I part from thee;
And all the budding honours on thy creſt
I'll crop, to make a garland for my head.
Firſt part of Henry IV. *act* v. *ſc.* 9.

Figuring a man who hath acquired great reputation and honour to be a tree full of fruit:

————————Oh, boys, this ſtory
The world may read in me; my body's mark'd
With Roman ſwords; and my report was once
Firſt with the beſt of note. Cymbeline lov'd me;
And when a ſoldier was the theme, my name
Was not far off; then was I as a tree,
Whoſe boughs did bend with fruit. But in one night,
A ſtorm or robbery, call it what you will,
Shook down my mellow hangings, nay my leaves;
And left me bare to wither.
Cymbeline act iii. *ſc.* 3.

"Bleſt be thy ſoul, thou king of ſhells, ſaid Swaran of the dark-brown ſhield. In peace, thou art the gale of ſpring; in war, the mountain-ſtorm. Take now my hand in friendſhip, noble king of Morven.
Fingal.

"Thou dwelleſt in the ſoul of Malvina, ſon of mighty Oſſian. My ſighs ariſe with the beam of the eaſt: my tears deſcend with the drops of night. I was a lovely tree in thy preſence, Oſcar, with all my branches round me: but thy death came like a blaſt from the deſart, and laid my green head low, the ſpring returned with its ſhowers, but no leaf of mine aroſe."
Fingal.

An *allegory* differs from a metaphor; and a *figure of ſpeech* differs from both. A metaphor is defined above to be an act of the imagination, figuring one thing to be another. An allegory requires no ſuch operation, nor is one thing figured to be another: it conſiſts in chooſing a ſubject having properties or circumſtances reſembling thoſe of the principal ſubject: and the former is deſcribed in ſuch a manner as to repreſent the latter: the ſubject thus repreſented is kept out of view: we are left to diſcover it by reflection; and we are pleaſed with the diſcovery, becauſe it is our own work. (See the word ALLEGORY.) Quintilian gives the following inſtance of an allegory,

O navis, referent in mare te novi
Fluctus. O quid agis? fortiter occupa portum.
Horat. lib. i. *ode* 14.

and explains it elegantly in the following words: "Totuſque ille Horatii locus, quo navim pro republica, fluctuum tempeſtates pro bellis civilibus, portum pro pace atque concordia, dicit."

In a *figure of ſpeech*, there is no fiction of the imagination employed, as in a metaphor; nor a repreſentative ſubject introduced, as in an allegory. This figure, as its name implies, regards the expreſſion only, not the thought; and it may be defined, the uſing a word in a ſenſe different from what is proper to it.— Thus youth, or the beginning of life, is expreſſed figuratively by *morning of life*: morning is the beginning of the day; and in that view it is employed to ſignify the beginning of any other ſeries, life eſpecially, the progreſs of which is reckoned by days. See FIGURE *of Speech.*

Metaphor and *allegory* are ſo much connected, that it ſeemed proper to handle them together: the rules particularly for diſtinguiſhing the good from the bad, are common to both. We ſhall therefore proceed to theſe rules, after adding ſome examples to illuſtrate the nature of an *allegory*, which, with a view to this article, was but ſlightly illuſtrated under its proper name.

Horace, ſpeaking of his love to Pyrrha, which was now extinguiſhed, expreſſeth himſelf thus:

——————Me tabula ſacer
Votivâ paries indicat uvida
Suſpendiſſe potenti
Veſtimenta maris Deo. *Carm. lib.* i. *ode* 5.

Again:

Phœbus volentem prælia me loqui,
Victas et urbes, increpuit, lyrâ
Ne parva Tyrrhenum per æquor
Vela darem. *Carm. lib.* iv. *ode* 15.

Queen. Great Lords, wiſe men ne'er ſit and wail their loſs,
But cheerly ſeek how to redreſs their harms.
What though the maſt be now blown overboard,
The cable broke, the holding-anchor loſt,
And half our ſailors ſwallowed in the flood!
Yet lives our pilot ſtill. Is't meet that he
Should leave the helm, and like a fearful lad,
With tearful eyes add water to the ſea,
And give more ſtrength to that which hath too much;
While in his moan the ſhip ſplits on the rock,
Which induſtry and courage might have ſav'd?
Ah, what a ſhame! ah, what a fault were this!
Third part of Henry VI. *act.* v. *ſc.* 5.

Oroonoko. Ha! thou haſt rous'd
The lion in his den; he ſtalks abroad,
And the wide foreſt trembles at his roar.
I find the danger now. *Oroonoko, act* iii. *ſc.* 2.

"My well-beloved hath a vineyard in a very fruitful hill. He fenced it, gathered out the ſtones thereof, planted it with the choiceſt vine, built a tower in the midſt of it, and alſo made a wine-preſs therein; he looked that it ſhould bring forth grapes, and it brought forth wild grapes. And now, O inhabitants of Jeruſalem, and men of Judah, judge, I pray you, betwixt me and my vineyard. What could have been done more to my vineyard, that I have not done? Wherefore when I looked that it ſhould bring forth grapes, brought it forth wild grapes. And now go to, I will tell you what I will do to my vineyard: I will take away the hedge thereof, and it ſhall be eaten up; and break down the wall thereof, and it ſhall be trodden down. And I will lay it waſte: it ſhall not be pruned, nor digged, but there ſhall come up briars and thorns: I will alſo command the clouds that they rain no rain upon it. For the vineyard of the Lord of hoſts is the houſe of Iſrael and the men of Judah his pleaſant plant." *Iſaiah.* v. 1.

The rules that govern metaphors and allegories are of two kinds. The conſtruction of theſe figures comes under the firſt kind: the propriety or impropriety of introduction comes under the other.—To begin with rules of the firſt kind; ſome of which coincide with thoſe already given for ſimilies; ſome are peculiar to metaphors and allegories.

In the firſt place, it has been obſerved, that a ſimile cannot be agreeable where the reſemblance is either too ſtrong or too faint. This holds equally in metaphor and allegory; and the reaſon is the ſame in all. In the following inſtances, the reſemblance is too faint to be agreeable.

Malcolm.————But there's no bottom, none,
In my voluptuouſneſs: your wives, your daughters,
Your matrons, and your maids, could not fill up
The ciſtern of my luſt. *Macbeth, act* iv. *ſc.* 4.

The beſt way to judge of this metaphor, is to convert it into a ſimile: which would be bad, becauſe there is ſcarce any reſemblance between luſt and a ciſtern, or betwixt enormous luſt and a large ciſtern.

Again:
He cannot buckle his diſtemper'd cauſe
Within the belt of rule. *Macbeth, Act* iv. *ſc.* 2,

There is no reſemblence between a diſtempered cauſe and any body that can be confined within a belt.

Again:

Steep me in poverty to the very lips.
Othello, Act iv. *ſc.* 9.

Poverty here muſt be conceived a fluid, which it reſembles not in any manner.

Speaking to Bolingbroke baniſh'd for ſix years:

The ſullen paſſage of thy weary ſteps
Eſteem a ſoil, wherein thou art to ſet
The precious jewel of thy home-return.
Richard II. *Act* ii. *ſc.* 6-

Again:
Here is a letter, lady,
And every word in it a gaping wound
Iſſuing life-blood.
Merchant of Venice, Act iii. *ſc.* 3.

Tantæ *molis* erat Romanam condere gentem.
Æneid. i. 37.

The following metaphor is ſtrained beyond all endurance: Timur-bec, known to us by the name of *Tamerlane the Great*, writes to Bajazet emperor of the Ottomans in the following terms:

"Where is the monarch who dares reſiſt us? where is the potentate who doth not glory in being numbered among our attendants? As for thee, deſcended from a Turcoman ſailor, ſince the veſſel of thy unbounded ambition hath been wreck'd in the gulf of thy ſelf-love it would be proper, that thou ſhouldſt take in the ſails of thy temerity, and caſt the anchor of repentance in the port of ſincerity and juſtice, which is the port of ſafety; leſt the tempeſt of our vengeance make thee periſh in the ſea of the puniſhment thou deſerveſt."

Such ſtrained figures, as obſerved above, are not unfrequent in the firſt dawn of refinement; the mind in a new enjoyment knows no bounds, and is generally carried to exceſs, till taſte and experience diſcover the proper limits.

Secondly, whatever reſemblance ſubjects may have, it is wrong to put one for another, where they bear no mutual proportion. Upon comparing a very high to a very low ſubject, the ſimile takes on an air of burleſque; and the ſame will be the effect where the one is imagined to be the other, as in a metaphor; or made to repreſent the other, as in an allegory.

Thirdly, Theſe figures, a metaphor eſpecially, ought not to be crowded with many minute circumſtances; for in that caſe it is ſcarcely poſſible to avoid obſcurity. A metaphor above all ought to be ſhort: it is difficult, for any time, to ſupport a lively image of a thing being what we know it is not; and for that reaſon, a metaphor drawn out to any length, inſtead of illuſtrating or enlivening the principal ſubject, becomes diſagreeable by overſtraining the mind. Here Cowley is extremely licentious: take the following inſtance.

Great and wiſe conqu'ror, who, where-e'er
Thou com'ſt, doſt fortify, and ſettle there!
Who canſt defend as well as get;
And never hadſt one quarter beat up yet;
Now thou art in, thou ne'er will part
With one inch of my vanquiſh'd heart;
For ſince thou took'ſt it by aſſault from me,
'Tis garriſon'd ſo ſtrong with thoughts of thee,
It fears no beauteous enemy.

For the ſame reaſon, however agreeable long allegories may at firſt be by their novelty, they never afford any laſting pleaſure: witneſs the *Fairy Queen*, which with great power of expreſſion, variety of images, and melody of verſification, is ſcarce ever read a ſecond time.

In the fourth place, the compariſon carried on in a ſimile, being in a metaphor ſunk by imagining the principal ſubject to be that very thing which it only reſembles; an opportunity is furniſhed to deſcribe it in terms taken ſtrictly or literally with reſpect to its imagined nature. This ſuggeſts another rule. That in conſtructing a metaphor, the writer ought to make uſe of ſuch words only as are applicable literally to the imagined nature of his ſubject: figurative words ought carefully to be avoided; for ſuch complicated figures, inſtead of ſetting the principal ſubject in a ſtrong light, involve it in a cloud, and it is well if the reader, without rejecting by the lump, endeavour patiently to gather the plain meaning, regardleſs of the figures:

A ſtubborn and unconquerable flame
Creeps in his veins, and drinks the ſtreams of life.
Lady Jane Gray, Act i. *ſc.* 1.

Copied from Ovid,

Sorbent avidæ præcordia flammæ.
Metamorph. lib. ix. 172.

Let us analyſe this expreſſion. That a fever may be imagined a flame, we admit: though more than one ſtep is neceſſary to come at the reſemblance: a fever, by heating the body, reſembles fire; and it is no ſtretch to imagine a fever to be a fire: again, by a figure of ſpeech, flame may be put for fire, becauſe they are commonly conjoined; and therefore a fever may be termed a *flame* But now admitting a fever to be a flame, its effects ought to be explained in words that agree literally to a flame. This rule is not obſerved here; for a flame drinks figuratively only, not properly.

King Henry to his ſon prince Henry:

Thou hid'ſt a thouſand daggers in thy thoughts,
Which thou haſt whetted on thy ſtony heart
To ſtab at half an hour of my frail life.

Second part Henry IV. *act* iv. *ſc.* 11.

Such faulty metaphors are pleaſantly ridiculed in the *Rehearſal*:

" *Phyſician.* Sir, to conclude, the place you fill has more than amply exacted the talents of a wary pilot; and all theſe threatning ſtorms, which, like impregnate clouds, hover o'er our heads, will, when they once are graſp'd but by the eye of reaſon, melt into fruitful ſhowers of bleſſings on the people.

" *Bayes.* Pray mark that allegory. Is not that good?

" *Johnſon.* Yes, that graſping of a ſtorm with the eye is admirable." *Act* ii. *ſc.* 1.

Fifthly, the jumbling different metaphors in the ſame ſentence, beginning with one metaphor and ending with another, commonly called a *mixt metaphor* ought never to be indulged.

K. Henry ——Will you again unknit
This churliſh knot of all abhorred war,
And move in that obedient orb again,
Where you did give a fair and natural light?

Firſt part Henry VI. *Act* v. *ſc.* 1.

Whether 'tis nobler in the mind, to ſuffer
The ſlings and arrows of outragious fortune;
Or to take arms againſt a ſea of troubles,
And by oppoſing end them.

Hamlet, Act iii. *ſc.* 2.

In the ſixth place, It is unpleaſant to join different metaphors in the ſame period, even where they are preſerved diſtinct; for when the ſubject is imagined to be firſt one thing and then another in the ſame period without interval, the mind is diſtracted by the rapid tranſition; and when the imagination is put on ſuch hard duty, its images are too faint to produce any good effect:

At regina gravi jamdudum ſaucia cura,
Vulnus alit venis, et cæco carpitur igni,

Æneid. iv. 1.

——— Eſt mollis flamma medullas
Interea, et tacitum vivit ſub pectore vulnus.

Æneid. iv. 66.

Motum ex Metello conſule civicum,
Bellique cauſas, et vitia, et modos,
Ludumque fortunæ, graveſque
Principum amicitias, et arma
Nondum expiatis uncta cruoribus,
Periculoſæ plenum opus aleæ,
Tractas, et incedis per ignes
Subpoſitos cineri doloſo.

Horat, Carm. lib. ii. *ode* 1.

In the laſt place, It is ſtill worſe to jumble together metaphorical and natural expreſſion, ſo as that the period muſt be underſtood in part metaphorically; in part literally; for the imagination cannot follow with ſufficient eaſe changes ſo ſudden and unprepared: a metaphor begun and not carried on, hath no beauty; and inſtead of light, there is nothing but obſcurity and confuſion. Inſtances of ſuch incorrect compoſition are without number: we ſhall, for a ſpecimen, ſelect a few from different authors Speaking of Britain.

This precious ſtone ſet in the ſea,
Which ſerves it in the office of a wall,
Or as a moat defenſive to a houſe
Againſt the envy of leſs happier lands.

Richard II. *act* ii. *ſc.* 1.

In the firſt line Britain is figured to be a precious ſtone: in the following line, Britain, diveſted of her metaphorical dreſs, is preſented to the reader in her natural appearance.

Theſe growing feathers pluck'd from Cæſar's wing,
Will make him fly an ordinary pitch.
Who elſe would ſoar above the view of men,
An eep us all in ſervile fearfulneſs.

Julius Cæſar, act i. *ſc.* 1.

Rebus anguſtis animoſus atque
Fortis appare: ſapienter idem
Contrahes vento nimium ſecundo
Turgida vela. *Hor.*

The following is a miſerable jumble of expreſſions, ariſing from an unſteady view of the ſubject, between its figurative and natural appearance:

But now from gath'ring clouds deſtruction pours,
Which ruins with mad rage our halcyon hours;
Miſts from black jealouſies the tempeſt form,
Whilſt late diviſions reinforce the ſtorm.

Diſpenſary, canto iii.

To thee the world its pleaſant homage pays,
The harveſt early, but mature the praiſe.

Pope's imitation of Horace, B. ii.

Oui, ſa pudeur ne'ſt que franche grimace,
Qu'une ombre de vertu qui garde mal la place,
Et qui s'evanouit, comme l'on peut ſavoir,
Aux rayons du ſoleil qu'une bourſe vait voir.

Moliere, L'Etourdi, Act iii. *ſc.* 2.

Et ſon feu, de pourvû de ſenſe et de lecture,
S'eteint à chaque pas, faut de nourriture,

Boileau, L'art poetique, chant. iii. l. 319.

Dryden, in his dedication of the tranſlation of *Juvenal*, ſays, " When thus, as I may ſay, before the uſe of the loadſtone, or knowledge of the compaſs, I was ſailing in a vaſt ocean, without other help than the pole-ſtar of the ancients, and the rules of the French ſtage among the moderns, &c."

" There is a time when factions, by the vehemence of their own fermentation, ſtun and diſable one another." *Bolingbroke.*

This fault of jumbling the figure and plain expreſſion into one confuſed maſs, is not leſs common in allegory than in metaphor.

Take the following examples:

——————Heu! quoties fidem,
Mutatoſque Deos flebit, et aſpera
Nigris æquora ventis
Emirabitur inſolens,
Qui nunc te fruitur credulus aureà:
Qui ſemper vacuam, ſemper amabilem
Sperat, neſcius auræ
Fallacis. *Horat. Carm. lib.* i. *ode* 5.

Pour moi ſur cette mer, qui'ici bas nous courons,
Je ſonge à pourvoir d'eſquif et d'avirons,
A regler mes deſires, à prévenir l'orage,
Et ſauver, s'il ſe peut, ma Raiſon du naufrage.
Boileau, epitre 5.

Lord Halifax, ſpeaking of the ancient fabuliſts: "They (ſays he) wrote in ſigns, and ſpoke in parables: all their fables carry a double meaning: the ſtory is one, and entire; the characters the ſame throughout; not broken or changed, and always conformable to the nature of the creature they introduce. They never tell you, that the dog which ſnapped at a ſhadow, loſt his troop of horſe; that would be unintelligble. This is his (Dryden's) new way of telling a ſtory, and confounding the moral and the fable together." After inſtancing from the hind and panther, he goes on thus: "What relation has the hind to our Saviour? or what notion have we of a panther's Bible? If you ſay he means the church, how does the church feed on lawns, or range in the foreſt? Let it be always a church, or always a cloven-footed beaſt; for we cannot bear his ſhifting the ſcene every line."

A few words more upon allegory. Nothing gives greater pleaſure than this figure, when the repreſentative ſubject bears a ſtrong analogy, in all its circumſtances, to that which is repreſented: but the choice is ſeldom ſo lucky; the analogy being generally ſo faint and obſcure, as to puzzle and not pleaſe. An allegory is ſtill more difficult in painting than in poetry: the former can ſhow no reſemblance but what appears to the eye; the latter hath many other reſources for ſhowing the reſemblance. And therefore, with reſpect to what the Abbé du Bos terms *mixt allegorical compoſitions*, theſe may do in poetry; becauſe, in writing, the allegory can eaſily be diſtinguiſhed from the hiſtorical part: no perſon, for example, miſtakes Virgil's Fame for a real being. But ſuch a mixture in a picture is intolerable; becauſe in a picture the objects muſt appear all of the ſame kind, wholly real or wholly emblematical. For this reaſon, the hiſtory of Mary de Medicis, in the palace of Luxembourg, painted by Rubens, is unpleaſant by a perpetual jumble of real and allegorical perſonages, which produce a diſcordance of parts, and an obſcurity upon the whole: witneſs, in particular, the tablature repreſenting the arrival of Mary de Medicis at Marſeilles; where, together with the real perſonages, the Nereides and Tritons appear ſounding their ſhells: ſuch a mixture of fiction and reality in the ſame group, is ſtrangely abſurd. The picture of Alexander and Roxana, deſcribed by Lucian, is gay and fanciful; but it ſuffers by the allegorical figures. It is not in the wit of man to invent an allegorical repreſentation deviating farther from any ſhadow of reſemblance, than one exhibited by Louis XIV. anno 1664; in which an enormous chariot, intended to repreſent that of the ſun, is dragged along, ſurrounded with men and women, repreſenting the four ages of the world, the celeſtial ſigns, the ſeaſons, the hours, &c. a monſtrous compoſition and yet ſcarce more abſurd than Guido's tablature of Aurora.

In an allegory, as well as in a metaphor, terms ought to be choſen that properly and literally are applicable to the repreſentative ſubject: nor ought any circumſtance to be added that is not proper to the repreſentative ſubject, however juſtly it may be applicable properly or figuratively to the principal. The following allegory is therefore faulty:

Ferus et Cupido,
Semper ardentes acuens ſagittas
Cote *cruenta* *Horat. lib.* ii. *ode* 8.

For though blood may ſuggeſt the cruelty of love, it is an improper or immaterial circumſtance in the repreſentative ſubject: water, not blood, is proper for a whetſtone.

We proceed to the next head, which is, to examine in what circumſtances theſe figures are proper, in what improper. This inquiry is not altogether ſuperſeded by what is ſaid upon the ſame ſubject in the article COMPARISON; becauſe upon trial, it will be found that a ſhort metaphor or allegory may be proper, where a ſimile, drawn out to a greater length, and in its nature more ſolemn, would ſcarce be reliſhed.

And, in the firſt place, a metaphor, like a ſimile, is excluded from common converſation, and from the deſcription of ordinary incidents. Secondly, in expreſſing any ſevere paſſion that totally occupies the mind, metaphor is unnatural.

The following example, of deep deſpair, beſide the highly figurative ſtyle, has more the air of raving than of ſenſe:

Caliſta. Is it the voice of thunder, or my father?
Madneſs? confuſion! let the ſtorm come on,
Let the tumultuous roar drive all upon me,
Daſh my devoted bark; ye ſurges, break it;
'Tis for my ruin that the tempeſt riſes.
When I am loſt, ſunk to the bottom low,
Peace ſhall return, and all be calm again.
Fair Penitent, act 5.

The following metaphor is ſweet and lively; but it ſuits not the fiery temper of Chamont, inflamed with paſſion: parables are not the language of wrath venting itſelf without reſtraint:

Chamont. You took her up a little tender flow'r,
Juſt ſprouted on a bank, which the next froſt
Had nipp'd; and with a careful loving hand,
Tranſplanted her into your own fair garden,
Where the ſun always ſhines: there long ſhe flouriſh'd,
Grew ſweet to ſenſe, and lovely to the eye;
Till at the laſt a cruel ſpoiler came,
Cropt this fair roſe, and rifled all its ſweetneſs,
Then caſt it like a loathſome weed away. *Orph. act* 4.

The following ſpeech, full of imagery, is not natural in grief and dejection of mind.

Gonſalez. O my ſon! from the blind dotage
Of a father's fondneſs theſe ills aroſe.
For thee I've been ambitious, baſe, and bloody:

Metaphor.

For thee I've plung'd into this ſea of ſin;
Stemming the tide with only one weak hand,
While t'other bore the crown (to wreathe thy brow),
Whoſe weight has ſunk me ere I reach'd the ſhore.
Mourning Bride, act 5. *ſc.* 6.

There is an enchanting picture of deep diſtreſs in Macbeth, where Macduff is repreſented lamenting his wife and children, inhumanly murdered by the tyrant. Stung to the heart with the news, he queſtions the meſſenger over and over: not that he doubted the fact, but that his heart revolted againſt ſo cruel a misfortune. After ſtrugling ſome time with his grief, he turns from his wife and children to their ſavage butcher; and then gives vent to his reſentment, but ſtill with manlineſs and dignity:

O, I could play the woman with mine eyes,
And braggart with my tongue. But, gentle Heav'n!
Cut ſhort all intermiſſion; front to front
Bring thou this fiend of Scotland and myſelf;
Within my ſword's length ſet him.—If he 'ſcape,
Then Heav'n forgive him too.

Metaphorical expreſſion, indeed, may ſometimes be uſed with grace where a regular ſimile would be intolerable: but there are ſituations ſo ſevere and diſpiriting, as not to admit even the ſlighteſt metaphor. It requires great delicacy of taſte to determine with firmneſs, whether the preſent caſe be of that nature: perhaps it is; yet who could wiſh a ſingle word of this admirable ſcene altered?

Metaphor.

But metaphorical language is proper when a man ſtruggles to bear with dignity or decency a misfortune however great; the ſtruggle agitates and animates the mind:

Wolſey. Farewell, a long farewell, to all my greatneſs!
This is the ſtate of man: to day he puts forth
The tender leaves of hope; to-morrow bloſſoms,
And bears his bluſhing honours thick upon him;
The third day comes a froſt, a killing froſt,
And when he thinks, good eaſy man, full ſurely
His greatneſs is a ripening, nips his root,
And then he falls as I do. *Henry* VIII. *act.* 3. *ſc.* 6.

METAPHRAST, a tranſlator, or perſon who renders an author into another form or another language, word for word.

METAPHYSICS.

1 Definition.

METAPHYSICS has been defined, by a writer deeply read in the ancient philoſophy, "The ſcience of the principles and cauſes of all things exiſting." This definition, we think, extremely proper: and hence it is, that *mind* or intelligence, and eſpecially the *ſupreme intelligence*, which is the cauſe of the univerſe and of every thing which it contains, is the principal ſubject of this ſcience; and hence, too, the ſcience itſelf received its name. Ariſtotle, indeed, who of all the ancient metaphyſicians whoſe works have come down to us, was unqueſtionably the greateſt, calls this ſcience THE FIRST PHILOSOPHY, as being not only ſuperior, but alſo prior in the order of nature, to the whole circle of the other arts and ſciences. But, "what is firſt to nature, is not firſt to man." Nature begins with *cauſes* which produce *effects*. Man begins with *effects*, and by them aſcends to *cauſes*. Thus all human ſtudy and inveſtigation proceed of neceſſity in the reverſe of the natural order of things, from *ſenſible* to *intelligible*, from *body* the effect, to *mind*, which is both the firſt and the final cauſe. Now, PHYSICS being the name given by the Stagyrite to the philoſophy of body, ſome of his interpreters, from this neceſſary courſe of human ſtudies, called that of mind METAPHYSICS, implying by that term, not only that its ſubject is more ſublime and difficult, but alſo that the ſtudy of it would be moſt properly and ſuceſsfully entered upon AFTER THAT OF PHYSICS. To this name, which, though it has ſometimes been treated with ridicule, is abundantly ſignificant, the followers of Ariſtotle were led by their maſter, who, to the books in which he pretends to elevate the mind above things corporeal to the contemplation of God and things ſpiritual, prefixed the Greeks words *μετα τα φυσικα* (A).

2 Diviſion of the Science into

The ſcience of Metaphyſics has been divided, according to the objects which it conſiders, into ſix principal parts which are called. 1. *Ontology*; 2. *Coſmology*; 3. *Anthropoſophy*; 4. *Pſychology*; 5. *Pneumatology*; and, 6. *Metaphyſical theology*.

3 Ontology;

1. That part of the ſcience which is named *ontology*, inveſtigates and explains the nature and eſſence of all beings, as well as qualities the and attributes that eſſentially appertain to them. Hence it has been ſaid that ontology ſhould proceed in its operations from the moſt ſimple ideas; ſuch as do not admit of any other qualities of which they may be compounded. Theſe ſimple ideas are of *being*, of *eſſence*, of *ſubſtance*, of *mode*, of *exiſtence* as well with regard to time as place, of a *neceſſary cauſe* of *unity*; the idea of *negation*; the difference between a *being* that is *ſimple* or *compound*, *neceſſary* or *accidental*, *finite* or *infinite*; the ideas of *eſſential* and *abſtract properties*, ſuch as of the *greatneſs*, *perfection*, and *goodneſs* of *beings*, &c. The buſineſs therefore of ontology, is to make us acquainted with every kind of being in its nature and eſſential qualities, which diſtinguiſh it from all other beings. This knowledge being once eſtabliſhed on ſimple principles, juſt conſequences may thence be drawn, and thoſe things proved after which the metaphyſician enquires,

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(A) ΤΩΝ ΜΕΤΑ ΤΑ ΦΥΣΙΚΑ. Cujus inſcriptionis hæc ratio eſt, quod in hoc opera ea tractantur quorum theoria poſterior eſt doctrina naturali ſaltem quoad nos, qui a corporum cognitione rerumque caducarum in ſubſtantiarum immaterialium atque immortalium contemplationem provehimur.
Du Val. Synopſ. Doctr. Peripat.

Diviſions of the Science

quires, and which is the buſineſs of his ſcience to prove.

It is eaſy to conceive, that even a clear knowledge of beings, and their eſſential properties, would be ſtill defective and uſeleſs to man, if he did not know how to determine and fix his ideas by proper denominations, and conſequently to communicate his perceptions to thoſe whom he would inſtruct, or againſt whom he is obliged to diſpute. To render our ideas therefore intelligible to others, we muſt have determinate words or denominations for each being, and the qualities of each being; and ontology teaches us thoſe terms which are ſo neceſſary to fix our ideas, and to give them the requiſite perſpicuity and preciſion, that when we endeavour to extend the ſphere of our knowledge, we may not waſte our time in diſputes about words.

4 Coſmology;

2. Metaphyſics, having, in as ſolid a manner as poſſible, explained and eſtabliſhed the principles above mentioned, continues its enquiries to the ſecond part, which is called *coſmology*, and examines into the eſſence of the world and all that it contains, its eternal laws; of the nature of matter; of motion; of the nature of tangible bodies, their attributes and adjuncts; and of all that can be known by reaſoning and experience. It is alſo in coſmology that the metaphyſicians of this ſchool examine the Leibnitzian ſyſtem; that is, whether God, in creating the world, muſt neceſſarily have created the beſt world; and if this world be ſo in fact. In this manner they purſue the argument, from conſequence to conſequence, to its laſt reſort, frequently with very little advantage to truth and ſcience.

5 Anthro- oſophy;

3. *Anthropoſophy*, or the knowledge of man, forms the third branch of metaphyſics. It is ſubdivided into two parts. The firſt, which conſiſts in the knowledge of the exterior parts of the human frame, belongs not to this ſcience, but to Anatomy and Phyſiology. The buſineſs of the metaphyſician is here to aſcertain the nature of thoſe powers by which all the motions eſſential to life are produced; and to diſcover, if poſſible, whether they be corporeal or ſpiritual. This inquiry leads at the ſame time to

6 ſychology

4. *Pſychology*; which conſiſts in the knowledge of the intellectual ſoul in particular; concerning which, the moſt profound, the moſt ſubtile, and moſt abſtract reſearches, have been made that human reaſon is capable of; and concerning the ſubſtance of which, in ſpite of all theſe efforts, it is yet extremely difficult to ſupport any poſitive opinion with concluſive or probable arguments.

7 neumaology;

5. The fifth part of metaphyſics is called *pneumatology*. By this term, which has not been long in uſe, metaphyſicians mean the knowledge of all ſpirits, *angels*, &c. It is eaſy to conceive what infinite art is neceſſary to give an account of that, of which nothing poſitive can ever be known in the preſent ſtate of human exiſtence. But the metaphyſician of this ſchool readily offers to ſhow us, "what is the idea of a ſpirit; the effective exiſtence of a ſpirit; what are its general qualities and properties; that there are rational ſpirits, and that theſe rational ſpirits have qualities that are founded in the moral attributes of God:" for this is in ſo many words what is attempted to be taught in pneumatology.

Diviſions of the Science

8 Metaphyſical theology.

6. *Metaphyſical theology*, which Leibnitz and ſome others call *theodicy*, is the ſixth and laſt branch of the ſcience of metaphyſics. It teaches us the knowledge of the exiſtence of God; to make the moſt rational ſuppoſitions concerning his divine eſſence, and to form a juſt idea of his attributes and perfections, and to demonſtrate them by abſtract reaſoning. Theodicy differs from natural theology, in as much as this laſt borrows, in fact, from theodicy proofs and demonſtrations to confirm the exiſtence of a ſupreme Being: but after having ſolidly eſtabliſhed that great truth, by extending its conſequences natural theology teaches us what are the relations and connections that ſubſiſt between the ſupreme Being and men, and what are the duties which reſult from thoſe relations.

9 This diviſion uſeleſs and improper.

We have briefly mentioned theſe diviſions of the ſcience, becauſe they were once prevalent in the ſchools. The greater part of them, however, appears to us to be not only ſuperfluous, but ſuch as can ſerve no other purpoſe than to perplex the mind. The only beings of which we know any thing are mind and body; and we have no reaſon to think that there are any other beings in the univerſe. Of bodies indeed there are various kinds, endowed with different properties: and it is extremely probable, that of minds endowed with different powers, the variety may be equally great. Our own minds we know to be united in one ſyſtem with bodies by which they perform all their operations; and we can demonſtrate that there is another Mind, which is independent of all body, and is the cauſe of all things. Between theſe there may be numberleſs orders of minds; but their energies are wholly unknown to us, and therefore they can never become the objects of ſcience.

Mind and body therefore, *i. e.* the minds and bodies which we know to exiſt, together with their powers and properties, eſſential and accidental, can alone be the ſubjects of rational inquiry. We may inquire into the eſſence of mind and the eſſence of body, and endeavour to aſcertain in what reſpects they differ. We may examine the nature of different bodies, in order to diſcover whether all bodies, however modified, have not ſomething in common; and we may conſider the properties, relations, and adjuncts of bodies, and endeavour to diſtinguiſh thoſe which are accidental from ſuch as appear to be ſo neceſſary that without them body itſelf could not exiſt. Of minds we cannot make the ſame compariſon. In this part of the ſcience we have not ſufficient data for an accurate and complete induction: we can only examine the powers of our own mind; and by probable analogy make ſome eſtimate of the powers of ſuperior minds, as obſervation will help us to gueſs at the powers of thoſe which are placed beneath us in the ſcale of exiſtence.

If this be ſo, Coſmology, as diſtinguiſhed from Ontology, cannot properly be a branch of Metaphyſics. For if mind and body, with their ſeveral powers, properties, and adjuncts, compoſe the univerſe, it is obvious, that when we have aſcertained, as well as we are able to aſcertain, the eſſence of mind and the eſſence of body, together with the powers and properties of each, and have traced them all to the firſt cauſe, we have done every thing in the ſcience of the univerſe, if we may uſe the expreſſion, which belongs to the province of the metaphyſician. The particular laws of motion on the earth and in the planetary ſyſtem belong to the natural philoſopher and aſtronomer.

In like manner, Anthropoſophy, Pſychology, and Pneumatology, if they be not words expreſſive of diſtinctions where there is no difference, ſeem to be at leaſt very needleſsly disjoined from each other. Of the nature of ſpirits we can know nothing but from contemplating the powers of our own minds; and the body of man is in the province, not of the metaphyſician, but of the anatomiſt and phyſiologiſt. Anthropoſophy, pſychology, and pneumatology, if they be uſed to denote our knowledge of all minds except the Supreme, are words of the ſame import; for of no created minds except our own can we acquire ſuch knowledge as deſerves the name of ſcience.

Ontology has ſometimes been defined the ſcience of *being in the abſtract*; but in the courſe of our inquiries it will be ſeen, that *being in the abſtract* is a phraſe without meaning. Conſidered as the ſcience of *real beings* and their *properties*, Ontology is a very ſignificant word, of the ſame import with Metaphyſics, comprehending in itſelf the knowledge of the nature of all things exiſting. Or if it be thought proper to make a diſtinction between ontology and theology, the former branch of the ſcience will teach the knowledge of body and created minds, whilſt it is the province of the latter to demonſtrate the exiſtence and attributes of that mind which is uncreated.

10
Another propoſed.

Body and mind therefore, with their properties, adjuncts, and powers, comprehend the whole ſubject of the ſcience of metaphyſics: and as we are earlier acquainted with body than with mind, the natural order of conducting our inquiries ſeems to be, to begin with the former, and thence proceed to the latter. It is however obvious, that if we would purſue theſe inquiries with any hopes of ſucceſs, we muſt firſt trace human knowledge from its ſource, aſcertain the nature of truth, and ſhow what kind of evidence on each topic to be treated ought to enforce conviction. In this view of the ſcience, metaphyſics appears to be divided into three parts; the firſt treating *of human underſtanding*; the ſecond, *of body with its adjuncts*; and the third, *of mind with its powers*.

11
Idea and notion explained.

Previous to the entering upon ſuch inquiries, ſome philoſophers of great merit have lately thought it expedient to explain the terms which they ſhould have occaſion to uſe. Their conduct is judicious and worthy of imitation; for the objects of metaphyſics being, for the moſt part, ſuch as fall not under the cogniſance of the ſenſes, are liable to be differently apprehended by different men, if the meanings of the words by which they are expreſſed be not aſcertained with the utmoſt preciſion. We intend, however, to uſe very few words but in the common acceptation; and we therefore hope, that as terms of ſcience are explained under different words in the Dictionary, to which references are made, we have little or no occaſion for ſwelling the article by previous definitions. There are indeed two words which have given riſe to much uſeleſs diſputation, which yet cannot be baniſhed from ſpeculative philoſophy, and which it will therefore be proper here to define. The words, to which we allude are *idea* and *notion*. Theſe are very generally conſidered as ſynonymous; but we think that much loquacity might have been avoided by aſſigning to each a determinate ſignification. We know not any philoſopher who made much uſe of the word *idea* before Plato; but with his myſterious doctrine concerning ideas we have here nothing to do: our preſent buſineſs is to aſcertain the preciſe meaning of the word, which is evidently derived from ειδω to *ſee*, as the word *notion* is from "noſco, novi, *notum*," and that from γινωσκω, to *know* or *underſtand*. In the original ſenſe of the two words, therefore, *notion* is more comprehenſive than *idea*, becauſe we *know* many things which cannot be *ſeen*. We have not a doubt, but that at firſt the word *idea* was employed to denote only thoſe forms of external objects which men contemplate in their imaginations, and which are originally received through the ſenſe of *ſight*. Its ſignification was afterwards extended to the relicts of every ſenſation, of touch, taſte, ſound, and ſmell, as well as of ſight; and at laſt it was confounded with *notion*, which denotes the mental apprehenſion of whatever may be known. In our uſe of the word *idea*, except when we quote from others, we ſhall employ it only to denote that appearance which abſent objects of ſenſe make in the memory or imagination (A); and by the word *notion* we ſhall denote our apprehenſion or knowledge of ſpirits, and all ſuch things as, though they be the objects of ſcience, cannot be perceived by the external ſenſes. Having ſaid this, we proceed to our inquiries, beginning with that into human underſtanding.

(A) In thus reſtricting the meaning of the word *idea*, we have the honour to agree with the great Engliſh Lexicographer.—"He was particularly indignant againſt the almoſt univerſal uſe of the word *idea* in the ſenſe of *notion* or *opinion*, when it is clear that *idea* can only ſignify ſomething of which an image may be formed in the mind. We may have an *idea* or *image* of a mountain, a tree, or a building; but we cannot ſurely have an *idea* or *image* of an *argument* or *propoſition*. Yet we hear the ſages of the law delivering their *ideas* upon the queſtion under conſideration; and the firſt ſpeakers in parliament entirely coinciding in the *idea*, which has been ſo ably ſtated by an honourable member; or repreſenting an *idea* as unconſtitutional, and fraught with the moſt dangerous conſequences to a great and free country. This Johnſon called *modern cant*." *Boſwell's Life of Johnſon*.

PART I. OF HUMAN UNDERSTANDING.

Preliminary Obſervations on the ORIGIN *of our* IDEAS *and* NOTIONS.

12 No innate ideas or notions in the human mind.

THAT the mind of man has no innate ideas or notions, but comes into the world ignorant of every thing, is a truth which ſince the days of Locke has been very little diſputed. In the firſt book of his Eſſay on the Human Underſtanding, that acute philoſopher has demonſtrated, that the rudiments or firſt principles of all our knowledge are communicated to us by ſenſation; and he has compared the mind previous to the operation of external objects upon the ſenſes, to a *tabula raſa* or ſheet of white paper. To repeat his arguments would ſwell the article to no purpoſe. There is not a man capable of attending to his own ideas, who can entertain a doubt in what manner he received them. Without the ſenſe of ſight, we could never have known colours; nor ſound without hearing; nor hardneſs, ſoftneſs, ſmoothneſs, pain, or bodily pleaſure, without touch; nor odours, without ſmell, &c.

Self-evident as theſe facts are, objections have been ſtarted to the inferences drawn from them; and Locke has been accuſed of advancing principles ſubverſive of all diſtinction between truth and falſehood, and favourable of courſe to univerſal ſcepticiſm.—"The firſt book of his Eſſay, which with ſubmiſſion (ſays Dr Beattie*) I think the worſt, tends to eſtabliſh this dangerous doctrine, that the human mind, previous to education and habit, is as ſuſceptible of one impreſſion as of another: a doctrine which, if true, would go near to prove that truth and virtue are no better than human contrivances; or at leaſt that they have nothing permanent in their nature, but may be as changeable as the inclinations and capacities of men; and that there is no ſuch thing as common ſenſe in the world. Surely this is not the doctrine which Mr Locke meant to eſtabliſh." We are ſo thoroughly ſatisfied that it is not, that we cannot help wondering how ſuch inferences could, by a man of learning, genius, and candour, be drawn from any thing which is to be found in the Eſſay on the Human Underſtanding.

But the Doctor thinks Mr Locke's "ſimile of the mind to white paper one of the moſt unlucky alluſions that could have been choſen; becauſe the human ſoul, when it begins to think, is not extended, nor of a white colour, nor incapable of energy, nor wholly unfurniſhed with ideas, nor as ſuſceptible of one impreſſion or character as of any other:" and it has been obſerved by another objector †, that "on a ſheet of white paper you may write that ſugar is bitter; wormwood ſweet; fire and froſt in every degree pleaſing and ſufferable; that compaſſion and gratitude are baſe; treachery, falſehood, and envy, noble; and that contempt is indifferent to us."

13 Objections anſwered.

All this is true: but we apprehend it is not to the purpoſe. Mr Locke has no where expreſſed himſelf in ſuch a manner as to lead us to ſuppoſe that he believed the ſoul to be extended or coloured; or, when it begins to think, incapable of energy, and wholly unfurniſhed with ideas: but he certainly did believe, that it begins not to think the firſt inſtant of its exiſtence, and that it *acquires* all the ideas of which it is ever poſſeſſed. We may undoubtedly write upon a piece of white paper that ſugar is bitter, and that wormwood is ſweet; but how the capacity of paper to receive the ſymbols of falſe propoſitions ſhould make Mr Locke's compariſon improper or dangerous, we cannot comprehend. Mr Uſher indeed ſays, that it is improper on this account, "that no human art or induſtry is able to make thoſe impreſſions upon the mind: in reſpect of them, the mind diſcovers not a paſſive capacity, but reſiſts them with the force of fate." Does it indeed? does the mind reject the idea of ſugar or of bitterneſs, of contempt or of indifference? May not any man have the *idea* of ſugar and at the ſame time the *idea* of bitterneſs, and compare the one with the other in his mind, as well as the word *ſugar* may be written beſide the word *bitter*, and connected with it on the ſame piece of paper? In all this we perceive nothing that is impoſſible or even difficult. The mind cannot indeed be made to feel that ſugar has the ſame taſte with woormwood; but who ever thought that it could? Not Mr Locke, we ſhall be bold to ſay; nor does his ſimile give the ſmalleſt countenance to ſuch an abſurdity. The author of the Eſſay on the Human Underſtanding underſtood his ſubject too well to imagine that either truth or falſhood could be communicated to paper, or that paper is capable of comparing ideas. Paper is capable of receiving nothing but lines or figures; and it paſſively receives whatever lines or figures we may chooſe to inſcribe on it: yet if a pen be carried over it in a circular direction, the figure impreſſed will not be a ſquare; juſt as, to the mind of one eating ſugar, the taſte communicated is not that of wormwood.

On a piece of paper a circle may be deſcribed, and cloſe beſide it a ſquare: in like manner an agreeable ſenſation may be communicated to the mind, and immediately afterwards a ſenſation that is diſagreeable. Theſe two ſenſations, or the ideas which they leave behind them, may be compared together; and it is certainly true that no art or induſtry can make them appear ſimilar in the mind: but is it not equally true, that no art or induſtry can make the circle and the ſquare ſimilar on the paper? The paper is ſuſceptible of any ſort of plain figures, and the mind is equally ſuſceptible of any ſort of ideas or ſenſations; but figures diſſimilar cannot be made to coincide, neither can diſcordant ideas be made to agree. Again, one may write upon paper, that "a circle *is* a ſquare," and likewiſe that a "circle *is not* a ſquare;" and both theſe propoſitions may be communicated to the mind by the organs of ſight or of hearing. The paper receives the *words* expreſſive of the falſe as well as thoſe expreſſive of the true propoſition; and the mind receives the *ideas* and *relations* ſignified by the one cluſter of words as well as thoſe ſignified by the other: but in the mind the *idea* of a ſquare is *different* from that of a circle, and on the paper the *figure* of a ſquare is *different* from the *figure* of a circle. The great difference between the mind and the paper is, that *the former* is *conſcious* of its ideas, and *perceives* their agreement or diſagreement; whereas the paper is *not* conſcious of

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*Eſſay on
he Nature
nd Immu-
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Truth.

† J. Uſher,
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es printed
or J. Da-
ies, Lon-
on, 1774.

the figures drawn upon it, nor perceives any thing about them. But ſtill thoſe figures are what they are; they either agree or diſagree on the paper, as well as the ideas either agree or diſagree in the mind. It is not in the power of the mind to alter the *ideas* of the ſquare and the circle, nor in the power of the paper to alter the *forms* of theſe figures.

It appears then, that the principles of Mr Locke, and the compariſon by which he illuſtrates them, have no more tendency to ſubvert the difference between truth and falſehood, right and wrong, than the paſſiveneſs of paper has to ſubvert the difference between a ſtraight line and a crooked, a circle and a ſquare: and with a view to eſtabliſh the doctrine of innate ideas and inſtinctive principles of knowledge, we might with as much propriety aſk, Whether it be poſſible to imagine that any mode of manufacture could make paper of ſuch a nature, as that a pen drawn over it in a circular direction would leave the figure of a ſquare? as that, "Whether it be poſſible to imagine, that any courſe of education could ever bring a rational creature to believe that two and two are equal to three?"

14 But all derived from ſenſation and reflection.

The mind being thus, as we may ſay, originally white paper, void of all characters, without ideas or notions of any kind, the firſt queſtion which we have to conſider is, Whence and in what manner it derives the materials of all its knowledge? To this queſtion the only anſwer which can be given is, That it derives them from obſervation and experience; from obſervation, either employed upon external objects of ſenſe, or turned inwardly upon its own operations. Our ſenſes, converſant about particular external objects convey into the mind ſeveral diſtinct perceptions; ſuch as thoſe of *colour*, *figure*, *heat*, *cold*, *bitterneſs*, *ſweetneſs*, and all thoſe things which are uſually called *ſenſible qualities*. The notions, ideas, or whatever elſe they may be called, which are acquired in this manner, may be called *ſenſible knowledge*; and the ſource of that knowledge is termed *ſenſation*.

The other fountain from which experience furniſhes the underſtanding with knowledge, is that attention which we are capable of giving to the operations of our own minds when employed about thoſe ideas which were originally ſuggeſted by objects of ſenſe. Theſe operations, when the ſoul comes to reflect on them, furniſh us with a ſet of notions entirely different from the ideas of ſenſe; ſuch as the notions of *perception*, *thinking*, *doubting*, *believing*, *reaſoning*, *knowing*, *willing*, and all the different energies and paſſions of our own minds. Of theſe operations we are always conſcious when we are awake: but it requires, as ſhall be ſhown afterwards, no inconſiderable effort to ſet them, as it were, at a diſtance, to reflect on them and conſider what they are; but when we have made this effort, we acquire notions as diſtinct, and perhaps more important, than thoſe ideas which we receive by the medium of the ſenſes.

Senſation and reflection then furniſh mankind with the firſt materials of all their knowledge. The mind ſeems not to have ideas or notions of any kind which it did not receive by one of theſe ways. By means of the ſenſes it perceives external objects; and by that power which it has of turning its attention upon itſelf, it diſcovers the nature and manner of its own operations.

Although the knowledge which we acquire from *reflection* be of equal importance, and perhaps of greater certainty than that which we receive through the medium of the ſenſes, it comes into the mind at a much later period; both becauſe it is impoſſible that the faculties of the mind ſhould operate without materials, and becauſe it is much more difficult to attend to theſe operations even while they are going on, than to the objects of ſenſe which ſolicit our attention. It is for this reaſon pretty late before children have any notions whatever of the operations of their own minds; and of the greater part of theſe operations the bulk of mankind have no clear or accurate notions during their whole lives. On the other hand, every human being is ſo ſurrounded with bodies, which perpetually and variouſly affect his ſenſes, that a variety of ſenſible ideas force an entrance even into the minds of children. In order therefore to trace the procedure of the underſtanding, and to aſcertain the extent and limits of human knowledge, it ſhould ſeem that we muſt begin with conſidering the external ſenſes, that we may diſcover the manner in which we receive knowledge by means of them, the objects of that knowledge, and its certainty. It is to be obſerved, however, that though we conſider the mind as poſſeſſed of many powers or faculties, and inquire firſt into the nature of that faculty which we conceive to be firſt exerted, this is done merely for the ſake of proceeding in our ſubject with method and perſpicuity. The mind is one ſimple and undivided being; and in every mental energy it is the whole mind, and not any part or portion of it, that is energetic. On this account, it is impoſſible to explain even the nature of ſenſation and perception to him who knows not what is meant by *will* and *underſtanding*; but to every one who is acquainted with the common import of theſe words, and who has read the ſhort ſyſtem of LOGIC inſerted in this Work, we hope that our theory of perception will be intelligible and convincing.

CHAP. I. *Of* SENSATION *and* PERCEPTION.

SECT. I. *Of Senſation.*

15 Senſation by five organs.

THE Supreme Being, who made us and placed us in this world, has given us ſuch powers of mind as he ſaw to be ſuited to our ſtate and rank in his creation. He has given us the power of perceiving many objects around us: but that power is limited in various ways; and particularly in this, that without the organs of the ſeveral ſenſes we perceive no external object. The ſenſes, as every one knows, are five in number, and each communicates its proper ſenſation. It is by the eyes alone that we ſee, by the ears that we hear, by the noſe that we ſmell, and by the tongue and palate that we taſte; the ſenſe of feeling or touch is ſpread over the whole body, for we feel equally by our hands and by our feet, &c. To the powers of perception by the ſenſes it is neceſſary not only that we have all the organs enumerated, but that we have them alſo in a ſound and natural ſtate. There are many diſorders of the eye which cauſe total blindneſs, as well as others which impair without deſtroying the power of viſion. The ſame thing is true of the organs of all the other ſenſes.

All this is ſo well known from experience, that it needs no proof; but it may be worth while to obſerve, that it is known from experience only [†]. For any thing that we know to the contrary, our Creator might have endowed us with the power of perception by a thouſand organs of ſenſe, all different from thoſe which we poſſeſs: and it is certain that he himſelf perceives every thing more perfectly than we do without bodily organs. For it is to be obſerved, that the organs of ſenſe are different from the being which is ſentient.—

16 Theſe organs themſelves not ſentient, but

It is not the eye which ſees, nor the ear which hears; theſe are only the organs by which we ſee and hear. A man cannot ſee the ſatellites of Jupiter but by means of a teleſcope, nor hear a low voice but by means of an ear-trumpet. Does he from this conclude, that it is the teleſcope which ſees thoſe ſatellites, or the trumpet which hears that voice? Such a concluſion would be evidently abſurd. It is no leſs abſurd to conclude that it is the eye which ſees, or the ear which hears. The teleſcope and the trumpet are artificial organs of ſight and of hearing, of which the eye and the ear are natural organs; but the natural organs ſee and hear as little as the artificial.

17 Inſtruments of ſenſation.

That this is the caſe with reſpect to the eye and the ear, is ſo obvious, that, as far as we know, it has never been denied. But with reſpect to the ſenſes of touch, taſte, and ſmell, the truth at firſt view appears not ſo evident. A celebrated writer has obſerved [*], that "after the utmoſt efforts, we find it beyond our power to conceive the flavour of a roſe to exiſt in the mind: we are neceſſarily led to conceive that pleaſure as exiſting in the noſtrils, along with the impreſſion made by the roſe upon that organ (c); and the ſame will be the reſult of experiments with reſpect to every feeling of taſte, touch, and ſmell. Touch (he ſays), affords the moſt ſatisfactory evidence, and philoſophy detects the deluſion." To detect this deluſion requires, indeed, no great depth in philoſophy; for it is ſo far from being true that we are neceſſarily led otherwiſe than by aſſociation, of which the laws ſhall be explained afterwards, to conceive the pleaſure or pain of touch as exiſting at that part of our body upon which the impreſſion is made, that, as every man muſt have obſerved, children previous to experience cannot diſtinguiſh the preciſe place of their bodies which is affected by the touch of any external object. Nay, we believe it will be found upon trial, that if a full grown man, with all the experience of age to guide him, be pricked with a pin on any part of his body which he has ſeldom handled, and never ſeen, he will not readily nor at firſt put his finger upon the wound, nor even come very *near* to the wound. This, however, he would certainly and infallibly do were the ſenſe of touch neceſſarily conceived as exiſting at the organ. To theſe obſervations objections may perhaps be made, which we cannot ſtay to obviate; but the following, we think, will admit of none. We appeal to every man who has experienced that particular ſenſation of touch which Scaliger dignified with the name of a ſixth ſenſe, whether whilſt theſe ſenſations were new to him, he was neceſſarily led to conceive them as exiſting at any particular organ. If he was not, it follows undeniably that the organs of ſenſation are different from the being which is ſentient; that it is not the eye which ſees, the ear which hears, the noſtrils which ſmell, the tongue which taſtes, nor any part of the body which feels: and that it is by experience that we learn to aſſociate our ſeveral ſenſations with thoſe organs upon which the impreſſions are made.

It is, however, certain that we receive no ſenſation from external objects, unleſs when ſome impreſſion is made upon the organ of ſenſe, either by the immediate application of the object itſelf, or by ſome medium which paſſes between the object and the organ [†]. In two of our ſenſes, viz. *touch* and *taſte*, there muſt be an immediate application of the object to the organ. In the other three the ſenſation is occaſioned by the impreſſion of ſome medium paſſing from the object to the organ. The effluvia of bodies drawn into the noſtrils with the breath are the medium of ſmell; the undulations of the air are the medium of hearing; and the rays of light paſſing from viſible objects to the eye are the medium of ſight. Theſe are facts known from experience to hold univerſally both in men and in brutes.

18 The brain and nerves neceſſary to ſenſation.

It is likewiſe a law of our nature perfectly known to all who know any thing of anatomy, that in order to actual ſenſation the impreſſions made upon the external organs muſt be communicated to the nerves, and from them to the brain. Firſt, the object, either immediately, or by ſome medium, makes an impreſſion upon the organ; the organ ſerves only as a medium, by which the impreſſion is communicated to the nerves; and the nerves ſerve as a medium to carry it on to the brain. Here the corporeal part ends; at leaſt we can trace it no farther. The reſt is all intellectual.

The proof of theſe impreſſions upon the nerves and brain in ſenſation is this, that from many obſervations and experiments it is found, that when the organ of any ſenſe is perfectly ſound, and has the impreſſion made upon it by the object ever ſo ſtrongly, yet if the nerve which ſerves that organ be cut or tied hard, there is no ſenſation, and it is well known that diſorders in the brain deprive us of ſenſation, while both the organ and its nerve are ſound.

19 Proceſs of nature in ſenſation.

There is ſufficient reaſon, therefore, to conclude, that in ſenſation the object produces ſome change in the organ; that from the organ the change proceeds to the nerve, and from the nerve to the brain. Hence it is that we have poſitive ſenſations from negative objects, or mere non-entities, ſuch as *darkneſs*, *blackneſs*, and *vacuity*. For, ſenſation reſulting from changes in the brain, whatever produces any change muſt of courſe occaſion a new ſenſation: but it is obvious, that the mere abſence of any impreſſion, by the removal of the object which produced it, muſt as neceſſarily cauſe a change in the organ, nerves, and brain, as the preſence of a new impreſſion from a new object. To theſe changes, or that which *immediately* produces them, we give the name of *impreſſions;* becauſe we know not how, in a general manner, to expreſs more properly any change produced by an external cauſe, without ſpecifying the nature of that cauſe. Whether it be preſſure, or attraction, or repulſion, or vibration, or ſomething unknown, for which we have no name, ſtill it may be called an impreſſion.

[†] Reid's Eſſays on the Intellectual Powers of Man.

[*] Elements of Criticiſm.

[†] Reid's Eſſays on the Intellectual Powers of Man, and Hartley's Obſervations on Man.

(c) Another eminent writer thinks on this ſubject very differently, and in our opinion much more juſtly.—"Suppoſe (ſays Dr Reid) a perſon who never had this ſenſe (viz. *ſmell*) before, to receive it all at once, and to ſmell a roſe; can he perceive any ſimilitude or agreement between the ſmell and the roſe? or indeed between it and any other object whatever? Certainly he cannot. He finds himſelf affected in a new way, he knows not why, or from what cauſe. He is conſcious that he is not the cauſe of it himſelf; but he cannot from the nature of the thing determine whether it be cauſed by body or ſpirit; by ſomething near, or by ſomething at a diſtance. He cannot give it a *place* any more than he can give a place to melancholy or joy: nor can be conceive it to have any exiſtence but when it is ſmelled." *Inquiry into the Human Mind*, ch. 2. ſect. 2.

20 In ſenſation the mind is partly active.

Sir Iſaac Newton was perhaps the firſt who ſuppoſed that the rays of light falling upon the bottom of the eye excite vibrations in the *tunica retina;* and that thoſe vibrations being propagated along the ſolid fibres of the optic nerves into the brain, cauſe the actual ſenſation of ſeeing. This hypotheſis was adopted by Dr Hartley, applied to the other ſenſes, and ſhewn to be at leaſt as probable as any which has yet been invented to account for the perception of external objects by means of the organs of ſenſe. Be this as it may, experience informs us, that whatever be the nature of thoſe impreſſions and changes which are made by external objects upon the ſenſes, nerves, and brain, we have without them no actual ſenſation, and of courſe perceive nothing *ab extra.* Hence it has been ſuppoſed, that the mind is wholly paſſive in ſenſation, and that ſenſation is *neceſſarily* produced by thoſe impreſſions. But this we believe to be a miſtake. Every man who has been attentive to his own thoughts and actions, muſt know inſtances of impreſſions having been certainly made upon his organs of ſenſe without producing any ſenſation, or ſuggeſting to his mind the perception of the particular objects by which the impreſſions were cauſed. He whoſe mind is intenſely employed in any particular purſuit, may have his eyes open upon an object which he does not ſee; or he may not hear the ſound of a clock ſtriking within two yards of him: Nay, we will venture to affirm, that there is hardly one reader of this article to whom ſuch abſences of ſenſation have not often occurred. Now, as there is no reaſon to ſuppoſe, that in the one caſe the undulations of the air, cauſed by the ſtriking of the clock did not reach his ears, or that in the other the rays of light, reflected from the object, did not fall upon his eyes, which are open to receive them; the only reaſon which can be aſſigned for his not having, in theſe inſtances, had audible and viſible ſenſations, is, that his mind was ſo engaged in ſomething elſe as not to pay to the vibrations in his brain that attention, if we may ſo ſay, without which impreſſions *ab extra* can produce no ſenſation. There are, indeed, ſome impreſſions on the organs of ſenſe ſo violent and ſo ſudden, as to force themſelves upon the mind however employed. Such are thoſe made on the ear by thunder, and on the eye by ſtrong light. In theſe caſes, ſenſation is involuntary and unavoidable; whence we conclude, not that in ſuch inſtances the mind is paſſive or deſtitute of energy, but that by the violent agitation given to the brain, it is rouſed from its reverie, and compelled to give attention. It appears, therefore, that in ſenſation the mind exerts ſome kind of energy; for in nothing but in the ſentient being itſelf can we ſeek for the cauſe why, when all external circumſtances are the ſame, organical impreſſions ſometimes produce ſenſations and ſometimes not; and that cauſe can only be the energy of the mind: what kind of energy, we pretend not to ſay.

Sect. II. *Of Perception by the Senſes.*

21 Difficult to account for the perception of objects.

How the correſpondence is carried on between the thinking principle within us and the material world without us, has always, as Dr Reid obſerves, been found a very difficult problem to thoſe philoſophers who conſider themſelves as obliged to account for every phenomenon in nature. It is, indeed, a problem of which we expect not to ſee a complete ſolution. A few ſteps beyond the vulgar we may certainly go; but the nature of that connection by which the mind and body are united, will probably remain for ever unknown. One queſtion, however, which has employed much of the attention of philoſophers, both ancient and modern, appears to be not wholly unanſwerable. It is, Whether by means of our ſenſes we perceive external objects mediately or immediately; or in other words, Whether ſenſation and perception be one and the ſame thing, or two things ſucceeding each other? On this ſubject, till of late, there appears to have been in the main a great uniformity in the ſentiments of philoſophers notwithſtanding their variations reſpecting particular points. Of ſome of the moſt eminent of them, we ſhall give the opinions as we find them collected by one * who is well acquainted with their writings, who is thoroughly qualified to eſtimate their reſpective merits, and who cannot be ſuſpected of partiality to that theory, which we feel ourſelves compelled to adopt.

22 The hypotheſis of Plato;

“ Plato illuſtrates our manner of perceiving external objects thus: He ſuppoſes a dark ſubterraneous cave, in which men lie bound in ſuch a manner as that they can direct their eyes only to one part of the cave. Far behind there is a light, of which ſome rays come over a wall to that part of the cave which is before the eyes of our priſoners. A number of men variouſly employed paſs between them and the light, whoſe ſhadows are ſeen by the priſoners, but not their perſons themſelves. In this manner did that philoſopher conceive, that by our ſenſes we perceive not things themſelves, but only the ſhadows of things; and he ſeems to have borrowed his notions on this ſubject from the diſciples of Pythagoras.

23 Of Ariſtotle;

“ If we make due allowance for Plato's allegorical genius, his ſentiments with reſpect to ſenſation and perception correſpond very well with thoſe of the Peripatetics. Ariſtotle, the founder of that ſchool, ſeems to have thought, that the ſoul conſiſts of two or three parts, or rather that we have three ſouls—the vegetable, the animal, and the rational. The animal ſoul he held to be a certain *form* of the body, which is inſeparable from it, and periſhes at death. To this ſoul the ſenſes belong: and he defines a ſenſe to be that which is capable of receiving the ſenſible forms, or ſpecies of objects, without any of the matter of them; as wax receives the form of the ſeal without any of its matter. Of this doctrine it ſeems to be a neceſſary conſequence, that bodies are conſtantly ſending forth, in all directions, as many different kinds of forms without matter as they have different ſenſible qualities. This was accordingly ly maintained by the followers of Ariſtotle, though not as far as we know, taught by himſelf. They diſputed concerning the nature of theſe forms or ſpecies, whether they were real beings or nonentities: but of matter and form we ſhall have occaſion to ſpeak afterwards.

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* Dr Reid in his Eſſays on the Intellectual Powers of Man.

24 Of Des Cartes; "After Ariſtotle had kept poſſeſſion of the ſchools for more than a thouſand years, his authority, which had often ſupplied the place of argument was called in queſtion by Lord Bacon and others. Des Cartes, however, was the firſt philoſopher who, convinced of the defects of the prevailing ſyſtem, attempted to form another entirely new: but on the nature of perception by means of the ſenſes he differs little or nothing from thoſe who had preceded him in that department of ſcience. He denies, indeed, and refutes by ſolid reaſoning, the doctrine which maintains that *images*, *ſpecies*, or *forms* of external objects, come from the objects themſelves, and enter into the mind by the avenues of the ſenſes. But he takes it for granted, as all the old philoſophers had done, that what we immediately perceive muſt be either in the mind itſelf, or in the brain, to which the mind is immediately preſent. The impreſſions made upon our organs, nerves, and brain, can be nothing, according to his philoſophy, but various modifications of extenſion, figure, and motion. There can be nothing in the brain like *ſound* or *colour*, *taſte* or *ſmell*, *heat* or *cold*. Theſe are ſenſations in the mind, which, by the laws of the union of the ſoul and body, are raiſed on occaſion of certain traces in the brain; and although he ſometimes gives the name of ideas to theſe traces, he does not think it neceſſary that they ſhould be perfectly like the things which they repreſent, any more than that words and ſigns ſhould reſemble the things which they ſignify.

"According to this ſyſtem it would appear, that we perceive not external objects *directly* by means of our ſenſes; but that theſe objects, operating either mediately or immediately upon the organs of ſenſe, and they again upon our nerves and brain, excite in the mind certain ſenſations; whence we *infer* the exiſtence of external objects from our ſenſations of which they are the cauſe. Perception of external objects, therefore, according to Des Cartes, is not one ſimple original act of the mind, but may be reſolved into a proceſs of reaſoning from effects to cauſes."

25 Of Malebranche; The doctrines of Malebranche, Locke, and Hartley, reſpecting perception, differ not eſſentially from that of Des Cartes. Malebranche, indeed, ſuppoſes, that external objects are not themſelves the cauſes of perception; but that the Deity, being always preſent to our minds more intimately than any other being, does, upon occaſion of the impreſſions made upon our organs of ſenſe, diſcover to us, as far as he thinks proper, and according to fixed laws, his own ideas of the object: and thus, according to him, we ſee all things in God, or in the divine ideas. He agrees, however, with Des Cartes and the ancient philoſophers, in conſidering it as a truth which it is impoſſible to queſtion, that we perceive not the objects without us, the ſun, moon, and ſtars, &c. becauſe it is not likely that the ſoul ſallies out of the body, and takes a walk, as it were, through the heavens to contemplate theſe objects. She ſees them not therefore by themſelves; and the immediate object of the mind, when it ſees the ſun, is not the ſun itſelf, but ſomething which is intimately united to the mind, and is that which he calls an *idea*.

26 Of Locke. Locke ſpeaking of the reality of our knowledge, ſays: "It is evident the mind knows not things immediately, but only by the intervention of the *ideas* it has of them." Our knowledge, therefore, according to him, is real only ſo far as there is a conformity between our ideas and the things which they repreſent. The manner of our perceiving external objects he illuſtrates by the following ſimilitude: "Methinks the underſtanding is not much unlike a cloſet wholly ſhut from light, with only ſome little opening left, to let in external viſible reſemblances or ideas of things without. Would the pictures coming into ſuch a dark room but ſtay there, and lie ſo orderly as to be found upon occaſion, it would very much reſemble the underſtanding of a man in reference to all objects of ſight, and the ideas of them [*]" He has elſewhere [†] defined an *idea* thus: "Whatſoever the mind perceives in itſelf, or is the immediate object of perception, thought, or underſtanding, that I call an *idea*; and the power to produce any idea in our mind, I call *quality* of the ſubject wherein the power is." He likewiſe thinks it "eaſy to draw this obſervation, that the ideas of what he calls primary qualities of bodies, viz. *extenſion*, *ſolidity*, *figure*, and *mobility*, &c. are reſemblances of theſe qualities as they really exiſt in the body themſelves."

This unguarded expreſſion which affirms that ideas in the mind are the reſemblances of external things, has brought upon Mr Locke much undeſerved ridicule. That on this and other occaſions he uſes the word *idea* with too great latitude, and that he often confounds ideas with ſenſations, and even with the cauſes of ſenſation, muſt be admitted by his warmeſt admirers: but we believe, that by an attentive reader, who peruſes his whole work, and compares ſuch paſſages as are obſcure with thoſe which are clearer, his meaning may always be diſcovered, and with reſpect to ſenſation and perception will generally be found juſt. That by calling the ideas of primary qualities reſemblances of the qualities themſelves, he meant nothing more than that bodies in all poſſible ſtates impreſs the ſenſes, nerves, and brain, in ſuch a manner as to produce in the mind certain ſenſations: between which and thoſe impreſſions there is an inſeparable, though unknown, connection, is evident from the account which he gives of the manner of perception. "Our ſenſes (ſays he), converſant about particular ſenſible objects, do convey into the mind ſeveral diſtinct perceptions of things, according to thoſe various ways in which theſe objects affect them: and thus we come by thoſe ideas we have of *yellow*, *white*, *heat*, *cold*, *ſoft*, *hard*, *bitter*, *ſweet*, and all thoſe which we call ſenſible qualities: which when I ſay the ſenſes convey into the mind, I mean they from external objects convey into the mind what produces thoſe perceptions." And as bodies can act only by impulſe, he adds, that "thoſe perceptions can be produced only by an impreſſion made upon the ſenſes, and ſome motion thence continued by our nerves to the brain or ſeat of perception."

27 Of Hartley. Dr Hartley was the pupil of Locke and Newton; and has, in a more ſatiſfactory manner than all who

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[*] Eſſay on the Underſtanding, book ii. chap. 11.

[†] Book ii, chap. 8.

had preceded or have ſince followed him, explained the material part of the proceſs of perception. His principles we ſhall have occaſion, during the courſe of the article, to develope pretty fully. For our preſent purpoſe it is ſufficient to ſay, that all his obſervations and arguments evidently ſuppoſe, that nothing diſtant from the mind can be perceived in the immediate act of ſenſation; but that the apparently immediate perception of external objects is an inſtance of early and deep-rooted aſſociation.

28
Of Hume.

In this ſentiment Mr Hume agrees with his predeceſſors; but he obſcures his philoſophy, and miſleads his reader, by confounding ſenſations with the impreſſions from which they proceed. "Every one (ſays he *) will allow, that there is a conſiderable difference between the perceptions of the mind, when a man feels the pain of exceſſive heat, or the pleaſure of moderate warmth, and when he afterwards recals to his memory this ſenſation or anticipates it by his imagination." The leſs forcible and lively of theſe perceptions he with great propriety calls *ideas;* but it is either through wilful perverſeneſs, or confuſion of intellect, that he chooſes to call the others *impreſſions*. Senſation and perception are cauſed by *impreſſions;* but they are no more impreſſions themſelves, than the pain occaſioned by the ſtroke of a bludgeon is the ſtroke itſelf, or the bludgeon with which it was ſtruck. But more of this afterwards.

29
Agreement of philoſophers, and the reaſon of it.

Thus far, then, that we perceive not external objects *directly*, but infer their exiſtence from certain ſenſations excited in our minds by the operation of theſe objects upon our *ſenſes*, *nerves*, and *brain*, ſeems to have been the opinion of every philoſopher from Pythogoras † to Mr Hume. For an opinion ſo univerſal, and at the ſame time ſo contrary to the perſuaſion of the multitude, ſome cogent reaſon muſt have been aſſigned. That reaſon has been given by many philoſophers, but by none with greater perſpicuity than the late Dr Porterfield in his eſſay concerning the motion of the eyes. "How body acts upon mind, or mind upon body (ſays he), I know not; but this I am very certain of, that nothing can act, or be acted upon, where it is not: and therefore our mind can never perceive any thing but its own proper modifications and the various ſtates of the ſenſorium to which it is preſent. So that it is not the external ſun and moon, which are in the heavens, that our mind perceives, but only their image or repreſentation impreſſed on the ſenſorium. How the ſoul of a ſeeing man ſees thoſe images, or how it receives thoſe ideas from ſuch agitations in the ſenſorium I know not; but I am ſure it can never perceive the external bodies themſelves to which it is not preſent."

This reaſoning appears to have force; and perhaps, the unanimous agreement of thinking men in all ages has ſtill greater force: yet the doctrine which prevailed ſo long, and which to Locke appeared ſo evident as to need no proof, has been lately called in queſtion by ſome eminent philoſophers of England; who, though they allow that we cannot perceive external objects but by means of the ſenſes, yet affirm that they are the objects themſelves which we perceive directly; and that in perception there is no aſſociation which can be reſolved into a proceſs of reaſoning from ſenſations the effects, to external objects the cauſes. Dr Reid, who was perhaps the firſt, and is unqueſtionably the ableſt of this claſs of philoſophers, has expreſſed himſelf on the ſubject as follows.

"If we attend to the ACT of of our mind which we call the perception of an external object of ſenſe, we ſhall find it in theſe three things: *firſt*, Some conception or notion of the object perceived. *Secondly*, A ſtrong and irreſiſtible conviction and belief of its preſent exiſtence. And, *thirdly*, That this conviction and belief are immediate, and not the effect of reaſoning ‡." To the firſt and ſecond of theſe propoſitions, we are perſuaded that Des Cartes and Locke would readily have aſſented; nor do we imagine that they would have denied the third, had the author allowed that this ſtrong and irreſiſtible conviction is the conſequence of an early and deep-rooted aſſociation reſolvable into a proceſs of reaſoning. This, however, the learned profeſſor does not allow; for he repeatedly affirms, that it is inſtinctive and original, and that "the conſtitution of our power of perception determines us to hold the exiſtence of what we diſtinctly perceive as a firſt principle, from which other truths may be deduced, but it is deduced from none." With this view of the matter, he could with no propriety attempt to ſupport his own opinion by argument but to the reaſonings of Dr Porterfield and others in defence of the Carteſian theory, he replies in the following words: "That nothing can act immediately where it is not, I think muſt be admitted (D); for I agree with Sir Iſaac Newton, that power without ſubſtance is inconceivable. It is a conſe-

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* Inquiry concerning Human Underſtanding, ſect. ii.

† See Moſheim's edition of Cudworth's Intellectual Syſtem, where the opinions of the philoſophers of antiquity are more faithfully collected than in any other work with which we are acquainted.

‡ Eſſays on the Intellectual Powers of Man, Eſſay II. ch. 5.

(D) One of the moſt celebrated of Dr Reid's followers thinks otherwiſe. "That no diſtinct ſubject can act upon the mind, is a propoſition (ſays Lord Kames) which undoubtedly requires evidence; for it is not inſtinctively certain: And, therefore, till the propoſition be demonſtrated, every man may without ſcruple rely upon the conviction of his ſenſes, that he hears and ſees things at a diſtance." But his Lordſhip ought to have known, that Locke and Berkeley, the two philoſophers whom he was combating, have no where called in queſtion the conviction of their ſenſes. They do not, indeed, admit, that the external organs are themſelves percipient, or that by means of them the mind can *immediately* perceive diſtant objects; but they have no where denied that through the *medium* of them the mind comes to the knowledge of external exiſtence. And the reaſons which they aſſign for this twofold opinion are, that in perception they experience action or the effects of action, which is not their own; and that it is an intuitive truth that nothing can act where it is not preſent. "But admitting (ſays his Lordſhip) that no being can act but where it is, is there any thing more ſimple or more common, than the acting upon ſubjects at a diſtance by intermediate means? This holds in fact with reſpect both to ſeeing and hearing." It certainly does, and with reſpect to the other ſenſes likewiſe; but it is the very thing for which Locke and Berkeley would have contended, had any man in their days preſumed to call it in queſtion. It is the very foundation of their ſyſtem; and if it be granted, nothing can be more evident than that external exiſtence is not the *immediate* object of perception. See *Appendix to Elements of Criticiſm.*

conſequence of this, that nothing can be acted upon immediately where the agent is not preſent: let this, therefore, be granted. To make the reaſoning concluſive, it is farther neceſſary, that when we perceive objects, either they act upon us, or we act upon them. This does not appear ſelf-evident, nor have I ever met with any proof of it ‡."

‡ Eſſays on the Intellectual Powers of Man, Eſſay ii. chap. 14.

Of the profundity of Dr Reid's underſtanding, we have the moſt firm conviction; nor is there any metaphyſician, ancient or modern, from whom we differ with greater reluctance: but we cannot help thinking this a very raſh aſſertion, as his own works appear to us to afford complete proof, that, in preception, the mind both acts and is acted upon. Let us attend however to the reaſons which, on this occaſion, induce him to think that in preception there is no action either of the object on the mind or of the mind on the object.

" When we ſay, that one being acts upon another, we mean, that ſome power of force is exerted by the agent, which produces, or has a tendency to produce, a change in the thing acted upon. If this be the meaning of the phraſe, as I conceive it is, there appears no reaſon for aſſerting, that in preception, either the object acts upon the mind or the mind upon the object. An object, in being perceived, does not act at all. I perceive the walls of the room where I ſit; but they are perfectly inactive, and therefore act not upon the mind. To be perceived, is what logicians call an external denomination, which implies neither action nor quality in the object perceived."

32
We think unſucceſsfully; and

This laſt ſentence we pretend not to underſtand. Subſtance without qualities is to us inconceivable, and certainly is no object of perception; for Dr Reid himſelf has told us, and told us truly, that " the objects of preception are the various qualities of bodies." That an object in being perceived does not act at all, is directly contrary to what the ingenious author has taught us, both in his *Inquiry* and in his *Eſſays*, viz. that " it is a law of our nature that we perceive not external objects, unleſs certain impreſſions be made by the object upon the organ, and by means of the organ upon the nerves and brain;" for if the external object in being perceived make impreſſions, it is certainly not true that it acts not at all. It is indeed readily acknowledged, that when one perceives the walls of the room where he ſits, theſe walls do not act immediately upon the organs of ſight; but it does not, therefore, follow that they are perfectly inactive: for it is known to all mankind, that from every point of the wall which is ſeen, rays of light are reflected to the eye; that thoſe rays make upon the *retina tunica* an impreſſion, which is conveyed by the optic nerve to the brain; and that this impreſſion on the brain is one of the immediate cauſes of viſion. In what *particular manner* it cauſes viſion, we ſhall never be able to diſcover, till we know more of the laws which unite mind and body, and by which one of theſe is qualified to act upon the other; but becauſe we know not the *manner* of this operation, to affirm that there is no operation at all, ſeems to be as abſurd as it would be to affirm, becauſe we perceive no neceſſary connection between a ſtroke and the ſenſation of ſound, that the ſound of a muſical ſtring is not cauſed by the ſtroke of a plectrum. That God might have given us powers of perception of a different kind from thoſe which we poſſeſs, there can be no doubt; but with what we might have been, we have no concern. As we are, we know perfectly that the eye is an inſtrument of viſion, becauſe without it nothing can be ſeen: we know alſo, that the retina and optic nerves are equally neceſſary; becauſe if they be diſordered, viſion is ſtill wanting: we know likewiſe, that the brain is neceſſary to all perception; becauſe when it is diſordered, thinking either entirely ceaſes or is proportionably diſturbed. And, laſtly, we are not more certain of our own exiſtence, than that *actual perception* takes not place but when the object makes an impreſſion upon ſome organ of ſenſe: for when no rays of light fall upon the eye, we ſee nothing; when no ſapid body is applied to the tongue and palate, we taſte nothing; and if we could be removed from every thing ſolid, we would feel nothing. Theſe are concluſions which cannot be controverted. They are admitted equally by the philoſopher and by the plain unlettered man of common ſenſe; nor are they rendered one whit leſs certain by our not being able to go a ſtep farther, ſo as to diſcover in what *manner* the brain or the affections of it can be the immediate inſtrument of ſenſation and perception. For (as Dr Reid, in the ſpirit of true philoſophy, obſerves ‡), " in the operations of mind, as well as in thoſe of bodies, we muſt often be ſatisfied with knowing that certain things are connected and invariably follow one another, without being able to diſcover the chain that goes between them. It is to ſuch connections that we give the name of *laws of nature*: and when we ſay that one thing produces another by a law of nature, this ſignifies no more, but that one thing which we call in popular language *the cauſe*, is conſtantly and invariably followed by another which we call *the effect*; and that we know not *how* they are connected."

‡ Inquiry into the Human Mind 4th edit. p. 258.

In the preceding ſection we have obſerved, that in ſenſation the mind exerts ſome energy: and therefore, as on every hypotheſis perception is a conſequence of ſenſation, it follows, that in preception the mind cannot be wholly inactive. Dr Reid, in his eſſays on the Intellectual Powers of Man, ſeems to affirm that it is. " I ſee no reaſon (ſays he) to believe, that in perception the mind acts upon the object. To perceive an object is one thing, to act upon it is another: Nor is the laſt at all included in the firſt. To ſay that I act upon the wall, by looking at it, is an abuſe of language, and has no meaning." This is indeed true: it would be a great abuſe of language to ſay, that by looking at the wall a man acts upon it; but we do not believe that any man ever ſaid or ſuppoſed ſuch a thing. The philoſophers whoſe opinion he is combating, might argue in this manner. We are conſcious that in perception the mind is active; nothing can act immediately where it is not; the mind cannot act immediately upon external exiſtence: external exiſtence, therefore, is not the immediate object of that energy which is exerted in perception. As Dr Reid affirms that external exiſtence is the immediate object of perception, he muſt deny the firſt propoſition in this argument; for *if it* be granted, as we have juſt ſeen that in his reply to Dr Porterfield he admits the ſecond, the laws of reaſoning will compel him to admit the third. To ſay, that in perception the mind acts not upon *external* objects, is a truth in which all mankind are agreed; and it is the very principle from which his antagoniſts infer, that the conviction of the preſent exiſtence of external objects is not an original and inſtinctive conſequence of ſenſation, but an early and deep-rooted aſſociation which may be reſolved into a proceſs of reaſoning. His meaning, therefore, muſt be, that in perception the mind *acts not at all:* but this is directly contrary to his definition of perception, which he calls an ACT of the mind: it is likewiſe contrary to this theory of perception, as it is detailed in *the Inquiry into the Human Mind on the principles of Common Senſe.* We are there taught, with equal elegance and perſpicuity, "that an impreſſion made by an external object upon the organ, nerves, and brain, is followed by a *ſenſation*, and that this ſenſation is followed by the preception of the object." We are likewiſe taught, that "although the Peripatetics had no good reaſon to ſuppoſe an active and paſſive intellect, they yet came nearer the truth, in holding the mind to be, in ſenſation, partly paſſive and partly active, than the moderns in affirming it to be purely paſſive. Senſation, imagination, memory, and judgment, have by the vulgar, in all ages, been conſidered as acts of the mind. The manner in which they are expreſſed in all languages ſhows this: for when the mind is much employed in them, we ſay, it is very active; whereas, if they were impreſſions only, we ought to ſay that the mind is very paſſive." All this is undeniable; but if ſenſation neceſſarily precede perception, and if in ſenſation the mind be active, what becomes of the aſſertion, that in perception it acts not at all? Indeed we may appeal to the common ſenſe of mankind, whether any thing can be perceived without ſome mental energy of the percipient. For when the impreſſions made on the external ſenſes are faint, in order to be conſcious of them an evident exertion is requiſite, not of the organ only, but alſo of the mind, as in perceiving very remote objects and ſounds; but when the impreſſions are ſtronger, the perception is involuntary and unavoidable, as has been already explained in the preceding ſection.

33
Therefore the old theory of perception to be preferred to his.

It being thus certain that in perception the mind both acts and is acted upon, and it being univerſally acknowledged that nothing can act where it is not, we feel ourſelves compelled to admit with the Carteſians, that in perception the conviction of the preſent exiſtence of external objects is not original and inſtinctive, but the conſequence of an early and unavoidable aſſociation of certain ſenſations with the cauſes which produce them. In this opinion we are ſtill more confirmed by the well-known fact, that particular preſſures upon the organ, nerves, and brain, excite not only ſenſations, but even perceptions of objects apparently external, when no ſuch objects are within the reach of our ſenſes. Thus §, if a man in the dark preſs either corner of his eye with his finger, he will ſee a circle of colours like thoſe in the feather of a peacock's tail, though no ſuch external object be before him, and though the room be ſo dark that nothing external could poſſibly be ſeen. Again, if a burning coal be nimbly moved round in a circle, with gyrations continually repeated, the whole circumference of the circle will at once appear on fire, though it is certain that there can be really on fire but one portion of that circumference, equal in length to the diameter of the coal. Theſe are facts known to all mankind; and they are perfectly irreconcileable with the ſuppoſition, that the perception of external objects by the ſenſe of ſight is original and inſtinctive; but they are at once accounted for, if it be true that rays of light falling from external objects upon the *retina tunica* agitate the optic nerves and brain, and that ſuch agitations excite ſenſations in the mind which experience has taught us to refer to external objects, as, under God, their ultimate cauſe.

But though we have declared ourſelves to be in this inſtance Carteſians, we do not admit all the abſurdities which have ſometimes been imputed to that ſyſtem of perception. We do not believe that external objects are perceived by means of images of them in the mind or the brain; nor do we think that Des Cartes or Locke has any where affirmed that they are, otherwiſe than by an expreſſion obviouſly figurative, denoting, not that the actual ſhapes of things are delineated in the brain or upon the mind, but only that impreſſions of ſome kind or other are conveyed to the brain by means of the organs of ſenſe and their correſponding nerves; and that between thoſe impreſſions and the ſenſations excited in the mind, there is a real, and in our preſent ſtate a neceſſary, though unknown, connection.

34
That theory fairly ſtated, and

Upon the whole, we think that there is good evidence for believing, that in perception the proceſs of nature is as follows: *Firſt,* If the object be not in contact with the organ of ſenſe, there muſt be ſome medium which paſſes between them; as, in viſion, the rays of light; in hearing, the vibrations of elaſtic air; and in ſmelling, the effluvia of the body ſmelled; otherwiſe we have neither ſenſation nor perception. *Secondly,* There muſt be ſome action or impreſſion upon the organ of ſenſe, either by the immediate application of the object, as in the two ſenſes of touch and taſte; or by the medium that goes between them, as in the other three ſenſes. *Thirdly,* The nerves which go from the brain to the organ, muſt receive ſome impreſſion by means of that which was made upon the organ; and by means of theſe nerves that impreſſion muſt be carried to the brain. *Fourthly,* The impreſſion made upon the organ, nerves, and brain, rouſes the dormant energy of the mind; and this double action of the mind and the object produces a ſenſation. And, *laſtly,* As we know by experience that the mind alone cannot by an exertion of its own produce one ſenſation, and are intuitively certain that nothing can be begin to exiſt without a cauſe, we infer from the exiſtence of any new ſenſation the exiſtence of ſome other cauſe than the internal energy of the mind, from which that ſenſation proceeds; and this cauſe experience teaches us to be the external object. This proceſs is carried on ſo rapidly, and the ſeveral parts of it, by being continually repeated, are ſo cloſely aſſociated, that except by a reflex act of the mind we diſtinguiſh them not from one another, and therefore we denominate the whole *perception.*

35
Shown to differ little from Dr Reid's.

It is with extreme diffidence that we advance a doctrine which Dr Reid has controverted: but he differs from us only in the laſt ſtage § of the proceſs, where he ſuppoſes ſenſation and perception to be two ſimple and independent acts of the mind. Yet he ſometimes expreſſes

§ Hartley's Obſervations on Man.

§ See Inquiry into the Human Mind, 4th edit. p. 383.

expreſſes himſelf, as if he thought as we do, that in perception the belief of the preſent exiſtence of external objects is rather the reſult of experience that an inſtinctive perſuaſion. Thus ſpeaking of the perception which we have in ſmelling a roſe, he ſays §, "Perception has always an external object, and the object of my perception in this caſe is that quality in the roſe which I diſcern by the ſenſe of ſmell. Obſerving that the agreeable ſenſation is raiſed when the roſe is near and ceaſes when it is removed, I am led by my nature [we think *by experience* would have been more proper] to conclude ſome quality to be in the roſe, which is the cauſe of this ſenſation. This quality in the roſe is the object perceived; and that act of my mind, by which I have the conviction and belief of this quality, is what in this caſe I call perception." Again (he ſays) that "three of our ſenſes, viz. ſmell, taſte, and hearing, originally give us only certain ſenſations, and a conviction that thoſe ſenſations are occaſioned by ſome external object. We give a name to that quality of the object by which it is fitted to produce ſuch a ſenſation, and connect that quality with the object and with its other qualities. Thus we learn, that a certain ſenſation of ſmell is produced by a roſe; and that quality in the roſe by which it is fitted to produce this ſenſation we call the *ſmell of the roſe*. Here it is evident that the ſenſation is original. The perception that the roſe has that quality which we call its *ſmell*, is acquired."

To this doctrine no Carteſian could poſſibly object; for it is the very account which Des Cartes himſelf would have given of perception by the organ of ſmell, as it reſolves ſuch a perception into an early aſſociation between a certain ſenſation and that external quality from which we know by experience that the ſenſation proceeds. Indeed the excellent author repeatedly affirms, that every different perception is conjoined with a ſenſation which is proper to it; and that the one is the ſign, and the other the thing ſignified. He likewiſe doubts *, whether children, from the time that they begin to uſe their ſenſes, make a diſtinction between things which are only conceived or imagined, and things which really exiſt. But if the conviction of the preſent exiſtence of external objects were in perception *inſtinctive*, we cannot ſee how there could be room for ſuch a doubt: for the mere ſenſes of children are as perfect as thoſe of full grown men; and they know well the difference between actually ſucking their nurſes and only thinking of that operation, though they be not capable of expreſſing that difference in language.

36
Both theories afford intuitive evidence that ſomething exiſts beſides the perception and the ſenſation.

But if in perception our conviction of the preſent exiſtence of external objects be not inſtinctive, what, it may be aſked, is the evidence that ſuch objects really exiſt? This queſtion we ſhall partly anſwer in the following ſection, and more completely when we come to examine Berkeley's theory of the non-exiſtence of matter: but from what has been ſaid already, it is ſufficiently evident, that every ſenſation compels us to believe in the preſent exiſtence of ſomething different from ourſelves, as well as from our ſenſations.

Objects of the reſpective Senſes.

SECT. III. *Of the Objects of each Senſe reſpectively.*

37
Touch, the ſenſe by which we perceive heat and cold, &c.

HITHERTO we have conſidered ſenſation and perception in general, and ſhown that is not by inſtinct that we perceive the exiſtence of external objects. This will appear more clearly, if we can aſcertain the preciſe nature of that information which each ſenſe affords us: and in order to this, we ſhall begin with the ſenſe of *touch*, not only becauſe it is that which is certainly firſt exerciſed, but alſo becauſe there is a meaning in which all the others may be reſolved into it.

38
The nature of heat and cold, which are perceived immediately.

By means of touch we perceive many things; of which the chief are, heat and cold, hardneſs and ſoftneſs, roughneſs and ſmoothneſs, extenſion, figure, ſolidity, and motion. Of theſe perceptions, ſome are immediate; and others, as we are perſuaded, early aſſociations, which may be reſolved into a proceſs of reaſoning. The perceptions of heat and cold are immediate. When a perſon for the firſt time in his life approaches the fire, he feels heat; and when he is firſt expoſed to the froſt, he feels cold. What are heat and cold, and where do they reſide? They are obviouſly the reverſe of each other; but are they external objects or mere ſenſations in the mind? They are undoubtedly ſenſations which have no exiſtence but when they are felt. To every man not altogether a ſtranger to theſe ſpeculations, this propoſition is ſelf-evident; but to the bulk of the people it appears an extravagant paradox. To make it plain, however, to the meaneſt capacity, it is ſufficient to obſerve, that at a certain diſtance the fire has no perceptible influence upon any perſon; if that diſtance be leſſened, we feel an agreeable warmth; approach a little nearer, and the wamth becomes diſagreeable; and ſtill nearer, it will riſe to pain. No man ſuppoſes the pain inflicted by a ſword to exiſt in the ſword, or any where elſe but in a ſentient being: It is equally abſurd to ſuppoſe pain to exiſt in fire, or any where elſe but in a ſentient being. But that which at one diſtance is pain, at another is only agreeable warmth; and ſince warmth and pain are only different degrees of the ſame feeling, it is equally abſurd to ſuppoſe the one as the other in the fire. What then is the object of ſenſe when we feel heat? There is obviouſly no object beyond the preſent ſenſation.

39
Their external cauſes.

But has the ſenſation of heat no cauſe independent of us? Undoubtedly it has, and experience teaches us that the cauſe is in the fire. We know that we cannot produce the ſenſation of heat in ourſelves by any mental energy of our own; and we are intuitively certain, that nothing can begin to exiſt without ſome cauſe. A man on the top of a mountain covered with ſnow, may imagine or remember what he felt when in the neighbourhood of fire, and thus have in his mind what is called an *idea* of heat; but that idea will not warm him (E) like the actual ſenſation, which no exertion of his own can in ſuch circumſtances produce.

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§ Eſſays on the intellectual Powers of Man, Eſſay ii. chap 15, and 21.

* Eſſays on the Intellectual Powers of Man.

(E)——Who can hold a fire in his hand,
By thinking on the froſty Caucaſus?
Or cloy the hungry edge of appetite,
By bare imagination of a feaſt?
Or wallow naked in December's ſnow,
By thinking on fantaſtic ſummer's heat?
Oh no! the apprehenſion of the good
Gives but the greater feeling to the worſe.

K. RICHARD II.

When he leaves the mountain, however, and approaches the fire, he feels the ſenſation actually produced, and produced as often as he makes the experiment. He is, therefore, under the neceſſity of inferring, that in the fire there is ſome power or quality which, acting either mediately or immediately upon his ſenſe of touch, excites the feeling which is called *heat*. What that power is, we ſhall perhaps never be able to diſcover; but it is ſelf-evident, that it is neither heat nor the reſemblance of heat, though in vulgar language it is known by that name.

The ſame reaſoning holds good with reſpect to cold. There is at certain times, and in certain countries, ſome power in the air which congeals water and cauſes cold; but that power is as different from the ſenſation of cold, as the power of fire is different from the ſenſation of heat, or the point of a ſword from a fleſh wound.

40
The perceptions of extenſion and figure, &c. not immediate.

By the ſenſe of touch we perceive extenſion, figure, and ſolidity, &c. but we do not perceive them *immediately* as we perceive heat and cold; for extenſion, figure, and ſolidity, are not ſenſations. Thoſe perceptions muſt then be acquired; and more clearly to aſcertain the manner in which we acquire them, let us ſuppoſe a man from his birth deſtitute of the ſenſe of ſight and the power of local motion, but poſſeſſed of intellect and every other faculty which we enjoy—Such a perſon, it is obvious, would be capable of every ſenſation and perception which is *original* to us, except the perception of colours; but we doubt whether it would be poſſible to give him perceptions of extenſion, figure, and ſolidity. Let us try: and as he cannot move a ſingle limb or member of himſelf, let as ſuppoſe a ſolid ſubſtance of ſmall dimenſions to be gently preſſed againſt any part of his body; what would ſuch preſſure communicate to him? We think it could communicate nothing but a new ſenſation, to which, as it is neither pleaſing nor painful, no name has hitherto been given, except the general one of *feeling*. This ſenſation he would not know whether to refer to an external or internal cauſe; or rather he would have no notion whatever of an external cauſe, though he would at the ſame time be conſcious that the new ſenſation was not excited by any energy of his own will. Were the preſſure to be gradually encreaſed till it roſe to pain, our blind man would ſtill be conſcious of nothing but a ſenſation, which could not lead him to the notion of extenſion, figure, or ſolidity, becauſe mere ſenſations cannot be conceived as either ſolid or extended. Let us next ſuppoſe the preſſure to be applied ſucceſſively to different parts of his body; he would now indeed be conſcious of ſucceſſive ſenſations, but he could not aſſign to them either extenſion or *place*: for it has been already ſhewn that the external parts of the body are not themſelves ſentient; and it ſhall be ſhewn afterwards, that to a man who has never perceived motion, place is abſolutely inconceivable. Laſtly, let us ſuppoſe the dimenſions of the preſſing ſubſtance to be greatly enlarged: what would then follow? nothing, we apprehend, but an increaſe of pain: for though the whole body were preſſed *ab extra*, the preſſure could affect the individual being which is ſentient, not more extenſively, but only more violently. It appears, therefore, that a man blind from his birth, and deſtitute of the power of local motion, could never be made to perceive extenſion, figure, or ſolidity.

41
How they are acquired.

Let us now ſuppoſe this man to receive by a miracle the uſe of his limbs, and to be ſuddenly prompted, by ſome inſtinctive impulſe, to ariſe and walk. So long as he met with no obſtacle in his way, he would not, we apprehend, acquire by this exerciſe any correct notions of extenſion or figure; but were a ſtone or log of wood of conſiderable dimenſions to be laid acroſs his uſual walk, the caſe would ſoon be altered. He would feel himſelf interrupted in his courſe, and he would at the ſame time recognize his wonted ſenſations of touch. After being twice or thrice thus interrupted he would learn from experience that that interruption or reſiſtance proceeded from the ſame cauſe which in this inſtance communicated to him the ſenſation of feeling; and were he to run his hand along the ſurface of a log or ſtone, he would perceive the reſiſtance and ſenſation continued. As every effect muſt have an adequate cauſe, this continued reſiſtance would compel him to believe the continuity of ſomething external in every direction in which he felt his hand reſiſted; but ſuch continuity of being is all that is meant by the word extenſion. At the very ſame time, and by the very ſame means, he would gradually acquire the perception of figure; for by running his hand in every direction over the ſurface of the obſtacle which oppoſed him, he would ſoon perceive it on all ſides limited; but the limits of extenſion is a phraſe of preciſely the ſame import with figure. It appears, therefore, that without the power of local motion, men could never by the ſenſe of touch acquire the notions of extenſion and figure; and the ſame will be found to be the caſe with reſpect to hardneſs and ſoftneſs.

42
Hardneſs and ſoftneſs, how perceived.

When we preſs our hand gently againſt a ſtock or a ſtone, we feel a ſenſation which is neither painful nor pleaſing. When we preſs it more violently, the ſenſation becomes painful, and we experience in the object a reſiſtance which we have not power to overcome. When we preſs butter or pomatum very gently, we have a ſenſation in all reſpects ſimilar to that which we felt when we gently touched the ſtock or the ſtone. But when we preſs the butter with violence, we feel no pain, and experience little reſiſtance; for the parts of which it is compoſed give way before the hand, though the parts of the ſtock or the ſtone remained fixed and immoveable. That the parts of the body ſhould thus reſiſt a preſſure to which the parts of another ſo readily yield, muſt proceed from ſome difference in the texture of the two bodies: for by the ſenſe of touch we perceive the effects to be different; and are therefore certain that they muſt proceed either from different cauſes, or from the ſame cauſe operating with different degrees of force. That particular texture which makes the parts of a ſtone reſiſt the preſſure of touch, we call hardneſs; and the texture which makes the parts of butter or pomatum give way to touch, we call ſoftneſs. But what hardneſs and ſoftneſs are in themſelves, touch cannot inform us; for they are neither ſenſations, nor ſimilar to ſenſations. We acquire, however, by experience, ſo complete notions of hardneſs and ſoftneſs, that every one who underſtands the Engliſh language perfectly knows the meaning of theſe words as ſoon as he hears them; and when he is told that

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that one body is hard and another ſoft, he knows with abſolute certainty that the meaning of the aſſertion is, that the parts of the body which is ſaid to be hard are held together by ſome unknown cauſe operating forcibly, and that the parts of the other are held together by the ſame or a ſimilar cauſe operating with leſs force.

43 Roughneſs and ſmoothneſs.

We acquire the notions of roughneſs and ſmoothneſs in the very ſame way and by the very ſame means that we acquire ideas of extenſion and figure. To deſcribe the proceſs at large would certainly be ſuperfluous; for if what we have ſaid concerning our perceptions of extenſion and figure be juſt and intelligible, every one will, without farther aſſiſtance, diſcover for himſelf how he perceives roughneſs and ſmoothneſs. *Motion* ſhall be conſidered among the adjuncts of body; but in order to underſtand what body itſelf is, it will be neceſſary, before we diſmiſs the ſenſe of touch, to inquire how we come by the notion of ſolidity.

44 Solidity, what; and how perceived.

Solidity is one of thoſe notions, or, in the language of Locke, one of thoſe ideas, which are commonly ſaid to be acquired by the ſenſe of touch. That touch gives the firſt hint towards our notion of ſolidity, is certainly true; but that hint muſt be afterwards improved by the intellect, or we never could have an adequate knowledge of what is meant when any thing is ſaid to be abſolutely ſolid. We know by experience, that we can at pleaſure open and ſhut our empty hand without meeting with any reſiſtance. We know likewiſe, that when we graſp an ivory ball of three or four inches diameter, no force which we can exert will bring together the ſeveral parts of the hand, which were eaſily brought together when we graſped nothing. In this way do we acquire our firſt notion of ſolidity; for that word denotes nothing more in this inſtance than the power or property of the ball, by which our fingers are excluded from the place which it occupies. Solidity differs from hardneſs in this reſpect, that hardneſs reſults from the ſtrong coheſion of the parts of a hard body, which renders it difficult to change the places of thoſe parts, as they reſpect one another; whereas ſolidity reſpects the whole maſs, and is as eſſential a quality of water as of adamant. A drop of water, indeed, placed between two plane ſurfaces of marble, will not like adamant preclude their contact; becauſe the parts of a drop of water, cohering but looſely to one another, give way to the preſſure, and eſcape in every lateral direction. But if a drop of water be confined on all ſides, as in a globe of gold, we know from experiment that no force will bring the ſides of the globe together without forcing the water through the pores of the metal; and hence we infer ſolidity to be eſſential to every corporeal ſubſtance.

Thus then it appears, that of the objects perceived by touch not one is *immediately* perceived except heat, cold, and other ſenſations. The ſenſations, as they are not excited by any internal energy of our own, lead us indeed to ſomething external as their cauſe; and by comparing the different ſenſations with each other, and obſerving what effects their external cauſes have upon our own motions, we are naturally led to conceive theſe cauſes as extended, figured, ſolid, hard or ſoft, rough or ſmooth, &c.; but it is obvious that this conception is the reſult of experience, and a proceſs of mental reaſoning.

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45 Nothing but mere ſenſations the objects of ſmell,

On the ſenſes of taſte, ſmell, and hearing, it is needleſs to ſay much. The immediate objects of theſe are confeſſedly ſenſations which have no exiſtence but when they are perceived; though experience teaches us to refer them all to external objects as their reſpective cauſes. With reſpect to ſmell, this has been made ſufficiently evident in the preceding ſection, and it is not leſs evident with reſpect to taſte and hearing.

46 Taſte, and

Certain bodies applied to the tongue and palate, and moiſtened with the ſaliva, excite certain ſenſations which we call taſtes. Theſe ſenſations, however, are not in the bodies; nor can they have any exiſtence but in a ſentient being. They are produced in conſequence of impulſes on the nerves of the tongue and palate, exciting certain agitations in the brain; but the ſenſation itſelf is neither impulſe nor agitation. Some ſubſtances excite taſtes which are agreeable, and others ſuch as are diſagreeable; and there are not a few which excite no taſte at all. Bodies, which applied to the tongue and palate of one man produce taſtes that are agreeable, applied to the ſame organs of another man give him taſtes which are diſagreeable; and we have all experienced, that the ſame ſubſtance, which, when the organs are ſound, excites a ſweet or pleaſant taſte, has, when the organs were diſordered, excited a taſte which was bitter or unpleaſant. Theſe facts, which cannot be controverted, afford the fulleſt evidence, if evidence were wanted, that taſte, as we feel it, is no quality of bodies, nor has any exiſtence out of the mind.

47 Hearing.

The organ of hearing is the *ear*, and its object is ſound. It is well known, that ſound is produced by certain vibrations of the air ſtriking the tympanum of the ear, and that thoſe vibrations are cauſed by the ſonorous body. Sound, however, is not vibration, nor the idea of ſound the idea of vibration. Sound conſidered by itſelf is a mere ſenſation, which can have no exiſtence but in a ſentient being. We know by experience, that it is cauſed by ſomething external; but we know likewiſe that the effect has no reſemblance to the cauſe. Previous to experience we could not refer ſound to any external cauſe; far leſs could we diſcern whether it proceeded from an object above us or below us, on our right hand or on our left. It appears to us ſelf-evident, that if a man born deaf were ſuddenly made to hear, he would conſider his firſt ſenſation of ſound as originating wholly within himſelf. Between that ſenſation and the ſenſations of touch, taſte, ſmell, and ſight, there is no reſemblance; nor are there any relations among them, which, previous to experience, could induce him to trace them all to external objects as their ſeveral cauſes. Our deaf man might have learned to refer all his other ſenſations to their true cauſes, in ſome ſuch way as we have deſcribed under the ſenſe of touch; but ſound would be ſomething ſo new to him, and ſo totally different from touch, taſte, and ſmell, that he could attribute it to nothing external.

48 It is by experience that we diſtinguiſh different ſonorous bodies by their reſpective ſounds.

Experience, however, would ſoon teach him, that the ear is its organ, and the ſonorous body its cauſe; and he would in time learn to diſtinguiſh one ſound, that of a trumpet for inſtance, from another, ſuppoſe the ſound of a bell; and to attribute each to its proper cauſe, even when neither the trumpet nor the bell was perceived by his other ſenſes. With reſpect to

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ſounds which we have been accuſtomed to hear, this is done ſo inſtantaneouſly, that ſome philoſophers have imagined it to be the effect of an inſtinctive principle in our nature, totally different from experience, and independent of reaſon. But the fact is not ſo. Long before we are capable of making ſenſation and perception objects of reflection, we have heard the ſound produced by the ringing of a bell, and ſeen the object which produced the ſound ſo often, that, when we hear a ſimilar ſound again, we inſtantly refer it to a *bell*, though we ſee not the bell from which it proceeds: but this is the effect of habit, and not of inſtinct. Had we never perceived a bell while ringing by either of our ſenſes of ſight or touch, we could not by the ſenſe of hearing acquire any notion of the figure or texture of the body from which the cauſe of the ſound proceeds, tho' we had heard that ſound every day of our lives. It is, indeed, by experience only that we learn to diſtinguiſh by the ear whether a ſonorous body be before or behind us, on our right hand or on our left; for we find it always difficult to ſay from what preciſe quarter a ſtrange ſound proceeds; and this difficulty would be heightened to impoſſibility, had not all ſounds ſomething in common. Dr Sparman relates, that when he firſt heard the roaring of a lion, he did not know on what ſide of him to apprehend danger, as the ſound ſeemed to proceed from the ground, and to incloſe a circle of which he and his companions ſtood in the centre. The ſame thing has happened to every man, when the ſound was ſuch as he had never heard before; even though it was neither ſo loud nor ſo terrific as the roaring of a lion in a deſert wilderneſs: but with reſpect to ſounds which we are daily hearing on each ſide of us, we ſoon learn to diſtinguiſh with tolerable accuracy whether they be before or behind us, above or below, on our right hand or on our left. All this, however, is the effect, not of inſtinct, but of experience improved into habit.

49
Sight originally perceives nothing but colours, which are mere ſenſations.

Sight is juſtly conſidered as the nobleſt and moſt comprehenſive of all our ſenſes. The reaſon is obvious: for when a full-grown man opens his eyes, he perceives houſes, trees, rivers the earth, ſun, and moon, &c. and to each of theſe objects belong figure, extenſion, colour, &c. which are all perceived inſtantly by means of this ſenſe. Yet it is certain, that the ſenſe of ſight does not originally communicate to us ſo many perceptions; and there is abundant evidence, that an infant cannot at firſt, or for ſome weeks after its birth, diſtinguiſh by viſion one object from another. *Colour* is the proper object of ſight, and for ſome time its only object; but colour as perceived by us is a mere ſenſation, which can have no exiſtence but in a ſentient being. If this propoſition ſtood in need of proof, we might obſerve that there are men, and even whole families, who poſſeſs the ſenſe of ſight in a degree of perfection ſufficient for all the purpoſes of life, and yet cannot diſtinguiſh certain colours from each other; blue, for inſtance, from green, or perhaps from red: and there is no man who can diſtinguiſh between ſome particular ſhades of blue and green by the feeble light of a candle. Were colours the real qualities of body, this miſtake of one for another could never be experienced. No man who poſſeſſes the ſenſe of touch ever confounded hardneſs with ſoftneſs, a ſphere with a cube, or an ell with an inch. The reaſon is, that hardneſs and ſoftneſs, figure and extenſion, are the qualities of things external; whereas colour being a mere ſenſation, is nothing but an affection or modification of the ſentient being. But it is obvious, that ſentient beings, according as they differ from one another, may be differently affected by the ſame external cauſe; ſo that one man may perceive that to be green which all other men perceive to be blue. The immediate external cauſe of the ſenſation of colour, is the rays of light reflected from the body, which in common language is ſaid to be coloured. Theſe rays falling upon the pupil of the eye, are refracted differently, according as their incidence is more or leſs oblique into points on the retina, where they form a picture of the external object; and from the picture, by means of the optic nerve, is communicated to the brain ſome impulſe or agitation, which produces viſion or the perception of colour. As rays of light are corporeal ſubſtances, it is obvious that they can act upon body only by impulſe; but between impulſe and the various ſenſations of *red*, *green*, *blue*, &c. there is no reſemblance. For the laws of reflection and refraction, and for the ſtructure of the eye, ſee OPTICS and ANATOMY. That which we have to inquire into at preſent is, how we learn, by means of the ſenſe of ſight, to perceive the figure, magnitude, motion, and diſtance of external objects, or indeed to diſtinguiſh one object from another.

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A ray of light proceeding, as all rays do, in a ſtraight line, muſt, however great its length, affect the eye, retina, and optic nerve, as if it were a ſingle point. From this obvious and undeniable fact, Biſhop Berkeley predicted *, that a man born blind, who ſhould be ſuddenly made to ſee, would at firſt perceive nothing without him, would diſtinguiſh neither the diſtance, ſize, figure, nor ſituation, of external objects; that he would only ſee in his eyes themſelves, or, to ſpeak more properly, would only experience new modifications in his mind, until joining *touch* to *ſight*, he formed thus a communication with the external world, and learned, by the ſimultaneous exerciſe of the two ſenſes, that natural language in which the *viſible* is the ſign of the *tangible*. This truth, which was diſcovered by the Biſhop merely by contemplating in his own mind the nature of ſenſation, and the known laws of optics, after having been laughed at for more than 20 years as one of the many dreams of a viſionary genius, was completely confirmed by the caſe of the famous patient whom Cheſelden cured of a cataract; and that too, though the cataract does not produce total blindneſs: which makes it evident, that the firſt viſual perceptions of the patient after his recovery could not be wholly new and unmixed. It may indeed be confirmed at any time by a ſimple experiment made upon an infant. For ſeveral weeks after birth, a child ſhuts not its eyes upon the ſudden approach of an object to them, nor ſhows the leaſt ſymptom of diſtinguiſhing one diſtance from another; and it is eaſy by a little attention, to obſerve, how it gradually learns to diſtinguiſh objects at greater and greater diſtances. Indeed colour, or the immediate object of ſight, being a mere ſenſation or affection of the mind, can have no natural relation whatever to any thing external.

It is plain, therefore, that diſtance is in its own nature imperceptible to the eye, and yet it is often perceived by ſight. How is this done? We think, in the following manner. Diſtance is one mode of extenſion, which we have already ſeen, is perceived by means of touch. Of ſhort diſtances, our firſt ideas are doubtleſs acquired by the ſtretching out and drawing back of our arms; and thoſe ideas are ſoon ſo connected with certain ſenſations which we have in actual viſion, that the latter inſtantly ſuggeſts the former.

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* Eſſay towards a new Theory of Viſion.

50 Perception of diſtance by ſight, how acquired.

Thus, it is a fact known by experience, that when we look at a near object with both eyes, according as it approaches or recedes from us, we alter the diſpoſition of our eyes, by leſſening or widening the interval between the pupils. This diſpoſition, or turn of the eyes, is attended with a ſenſation of which every man is conſcious at the time of viſion; and this ſenſation ſeems to us to be that which in this caſe ſuggeſts the idea of greater or leſs diſtance to the mind. Not that there is any natural or *neceſſary* connection between the ſenſation of which we are conſcious, and greater or leſs diſtance; for the ſenſation is wholly internal, and the diſtance is external: But becauſe the mind has by conſtant *experience*, found the different ſenſations occaſioned by different diſpoſitions of the eyes to correſpond to different degrees of diſtance in the object, there has grown an habitual or cuſtomary connection between thoſe ſenſations and the notions of greater or leſs diſtance. So that the mind no ſooner perceives the ſenſation ariſing from the different turn it gives the eyes in order to bring the *pupils* nearer or farther aſunder, than it is inſtantly impreſſed with a certain notion of the diſtance which was wont to be connected with that ſenſation. Again, an object placed at a certain diſtance from the eye, to which the breadth of the pupil bears a ſenſible proportion, being made to approach nearer, is ſeen more confuſedly; and the nearer it is brought, the confuſion is always the greater. The reaſon of all this is known to every optician: but it being conſtantly experienced by thoſe who never dipt into optics, there ariſes in the mind of every man an habitual connection between the ſeveral degrees of confuſion and diſtance; the greater confuſion ſtill implying the leſs diſtance, and the leſs confuſion the greater diſtance. It is of no avail to ſay, that between confuſed viſion and diſtance, great or ſmall, there is no neceſſary connection: for there is as little connection between a bluſh in the face and the mental feeling of ſhame; and yet no ſooner does a man of obſervation perceive that particular colour in the face of another, than it ſuggeſts to him the notion of that feeling or paſſion with which he has conſtantly obſerved it accompanied.

In theſe ways, however, we perceive only ſmall diſtances. Of diſtances more remote our judgment is formed from other data; and happily theſe data are not far to ſeek. It is a fact known to every man who is not totally ignorant of the ſcience of optics, that a greater number of rays fall upon the eye when reflected from a body near at hand, than can fall from the ſame body at a diſtance; and as thoſe rays operate by impulſe, it is ſelf-evident that the impreſſion muſt be ſtronger, and of courſe the ſenſation or colour more vivid, when the body is near than when it is diſtant. Now having acquired the notion of the true diſtance of objects by motion and the ſenſe of touch, and finding by uniform experience, that as they are near or far off, the ſenſation of colour which they excite in the mind through the organ of viſion is more or leſs vivid, thoſe degrees of ſenſation come to be ſo cloſely aſſociated with the reſpective diſtances of the object, that the one inſtantly ſuggeſts the other.

51 How figure is perceived by ſight,

It is juſt ſo that we perceive figure by ſight. Having experienced by the ſenſe of touch that one ſurface is a ſquare and another a circle, that one body is a cube and another a ſphere; and finding our ſenſe of ſight differently affected by the ſquare and the circle, by the cube and the ſphere; theſe different affections come to be ſo cloſely connected in our minds with the figures of the reſpective bodies, that long before we are capable of reaſoning on the ſubject the one is never preſent to us without ſuggeſting the other. Nay, ſo complete in this caſe is the connection or aſſociation, that we cannot even in idea abſtract the colour from the figure; though it is certain that colour is a mere ſenſation, and figure an external quality; that colour alone is immediately perceivable by the eye, and the notion of figure ſuggeſted by the colour. We are aware that it has been affirmed, and affirmed with great vehemence, that figures of two dimenſions are immediately perceived by the eye, and perceived with greater accuracy than by the ſenſe of touch. But they who inſiſt upon this doctrine affirm likewiſe, contrary to experience and the cleareſt reaſoning, that the immediate objects of ſight are external, and that colour is a quality of bodies. In the arguments too by which they ſupport their hypotheſis, they ſeem to confound ſight as an affection of the mind, with the picture on the bottom of the eye, as if the retina were the ſentient being; whereas the retina and picture are no more than inſtruments of ſenſation. It is indeed a fact, that the picture has the ſame figure nearly with the plane of the object which is preſented to the eye; as when the object is a ſphere, the picture is a circle variouſly ſhaded in colour. It is likewiſe a fact, that the picture is enlarged in proportion as the object is brought near, and diminiſhed as it is carried to a diſtance. But theſe facts are known only to perſons ſkilled in optics; and therefore it is evident, that though calculations may be raiſed from them by mathematicians to determine the diſtance and figure of external objects, they cannot poſſibly be the data from which diſtance and figure are inferred by the vulgar, who know not that ſuch pictures on the retina exiſt. Beſides all this, it is univerſally known, that a painter, by laying on his colours properly, can make a plain ſquare ſurface appear to the eye in certain poſitions as an oblong or as a cube, and a plain circular ſurface as a concave or a convex hemiſphere. But not one of theſe things could poſſibly done, were figure or indeed any thing elſe than colour, the immediate object of viſion.

52 Magnitude,

As we ſee diſtance and figure, ſo we ſee magnitude; and we ſee both in the ſame way that we ſee ſhame or anger in the looks of a man. The impreſſion made upon the bottom of the eye by rays reflected from a large magnitude, muſt neceſſarily be different from the impreſſion made by rays reflected from a magnitude that is leſs. This is ſelf-evident: and ſince the impreſſion *ab extra* is in ſome way or other the cauſe of that ſenſation, which is all of which we are originally conſcious in viſion, it is obvious that the ſenſation,

Objects of the reſpective Senſes.

like every other effect, muſt correſpond to the cauſe from which it proceeds. Being therefore conſcious of different ſenſations; and having, at an earlier period than we diſtinctly remember, learned by experience to refer them to different magnitudes; no ſooner is each ſenſation excited than it ſuggeſts the notion, or if you pleaſe the perception, of that magnitude with which it is connected. So completely is this aſſociation fixed in the mind, that when we look at a known object, its real magnitude appears to be as inſtantly obſerved as its colour, whilſt we hardly attend at all to the particularity of the ſenſation by which the magnitude is ſuggeſted. It is indeed cuſtomary with writers on optics to diſtinguiſh between tangible and viſible magnitude, as if any kind of magnitude were the immediate object of viſion: but this is not ſo; for magnitude is ſomething external, whereas the immediate object of viſion is a mere ſenſation. What has introduced into ſcience this mode of ſpeaking is the following fact, that as we approach a diſtant object it appears to the eye larger and larger every ſtep, and leſs and leſs as we recede from it; whereas the tangible magnitude of an object is always the ſame. The reaſon of this apparent change of magnitude to the eye, according to the diſtance at which any particular object is viewed, is, that from a near object rays of light fall in greater numbers and more diverging than from the ſame object viewed at a diſtance. This of courſe alters the nature of the viſible ſenſation: each common ſenſation is in the mind cloſely linked with a particular notion of magnitude; and by the exerciſe of ſight and touch we have learned from experience, that the particular ſenſation cauſed by diverging rays muſt be referred to a larger magnitude than that which is cauſed by parallel rays proceeding from the ſame diſtance.

53
Viſible ſenſations a kind of natural language.

Upon the whole, then, we think ourſelves intitled to conclude, that the proper and original objects of viſion conſtitute an univerſal language of the Author of Nature, by which we are inſtructed how to regulate our actions, in order to attain thoſe things that are neceſſary to the preſervation and well-being of our bodies, as alſo to avoid whatever may be hurtful or deſtructive to them. It is principally by the information of this language that we are guided in all the tranſactions and concerns of life: And the manner in which it ſignifies and marks to us the objects which are at a diſtance, is ſimilar to that of languages and ſigns of human appointment, which do not ſuggeſt the things ſignified by any likeneſs or identity of nature, but only by an habitual connection, which experience has made us to obſerve, between them. This language of the eye, like the language of the tongue, ſuggeſts by one ſenſation what may be reſolved into a variety of perceptions. A tree is compoſed of a trunk, branches, leaves; it has colour, figure, ſize; and all theſe things are at once ſuggeſted to the mind by the two words *ſpreading oak*. Juſt ſo it is with reſpect to viſion: the ſenſation received by the eye ſuggeſts at once the *trunk*, *branches*, *leaves*, *colour*, *figure*, and *ſize* of the oak, and ſuggeſts them all as the qualities of one object.

Chap. II. *Of* Retention *and* Ideas.

Retention and Ideas.

54
Senſations and perceptions remain for a very ſhort time after the removal of their objects.

FROM the experiment with the burning coal mentioned in n° 33, it is apparent, that ſenſations excited through the eye, together with their correſponding perceptions, remain in the mind for a ſhort time after the external exciting cauſe is removed. The ſame thing appears from another experiment which was firſt made by Sir Iſaac Newton, and which every man may repeat for his own ſatisfaction. It is univerſally known*, that a proper mixture of the ſeven original colours, *red*, *yellow*, *green*, *blue*, &c. conſtitutes that uniform appearance which we call *white*. But when theſe colours are made to paſs in a rapid conſecution before the eye, they excite the very ſame perception as when they are properly mixed: which is a ſatisfactory proof that the impreſſion made by each ſeparate colour remains in the brain until a revolution of all the colours be completed; for nothing but the impreſſion of all the colours at *once* can produce the ſenſation and perception of *white*. Indeed no perſon capable of paying the proper attention to theſe things, can keep his eye fixed upon a luminous object, and afterwards ſhut it, without experiencing that the ſenſation and perception remain for ſome time after the external object is ſhut out, and that they go off gradually till they leave behind them the mental appearance, which is properly called an *idea* of the object.

The ſame continuance of the ſenſation after the removal of its cauſe is equally obſervable in the ſenſe of hearing: for every ſound which we hear is reflected by the neighbouring bodies; and therefore conſiſts in reality of a variety of ſounds ſucceeding each other at different diſtances of time, according to the diſtances of the ſeveral reflecting bodies. Yet this cauſes no confuſion or apparent complexity of ſound, unleſs when the diſtance of the reflecting bodies is very conſiderable, as in ſpacious buildings.

With reſpect to the continuance of the ſenſation of touch, doubts have been ſtarted; but for theſe there is as little room as for doubting the continuance of the ſenſations of ſeeing and hearing. The continuance of heat after the heating body is removed, and of the ſmart of a wound after the inſtant of infliction, are proofs that every ſenſation of touch does not vaniſh with its cauſe. A man unuſed to the motion of a ſhip or a coach, after having been a day at ſea or on the road, feels or imagines he feels the rolling of the ſhip or the jolting of the coach after he is in bed and actually at reſt. Of theſe facts we know not what other account can be given, than that the agitation in the brain, which is the immediate cauſe of the ſenſation of touch, remains for ſome time after the external cauſe of the agitation is removed.

As to the ſenſes of taſte and ſmell, Dr Hartley ſeems to think that there is no clear and direct evidence for the continuance of their ſenſations after their proper objects are removed: but in this inſtance the ingenious author does not juſtice to his own theory. Let any man eat onions, garlic, or any other thing of a very pungent taſte, and immediately waſh his mouth with freſh water, ſo as that he may be ſure no part of the ſapid body remains on his tongue or palate. According to this doctrine, the taſte of the onion or garlic ſhould inſtantly vaniſh with its object; but the fact is otherwiſe. Whoever ſhall make the experiment, will find the ſenſation to remain a conſiderable time; not indeed in its original force, but weakened no more than what it muſt neceſſarily be by the introduction of a new ſenſation excited by the water. It is more difficult to aſcertain the permanency of ſmell: but analogy inclines us to believe, that in this particular it reſembles the other ſenſes, though we know not how to direct the reader to an experiment which will give him abſolute conviction.

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* Hartley on Man.

55 Hence we rive that ower or culty called memory.

Whether the cauſe of theſe continued ſenſations, after the removal of their objects, be in the brain alone, in the mind alone conſidered as an immaterial being, or in both together, is of very little importance; becauſe, taking the mind and its internal organs as one *metaphyſical whole**, it matters not to our preſent inquiry, where this retentive power reſides, as long as it can be proved to exiſt within us: for it ſeems evident, that what has the faculty of retaining a ſenſation when no longer acted upon by the object which excited it, muſt alſo have a power to preſerve the veſtiges of that ſenſation even after the ſenſation itſelf ſhall be entirely obliterated. This is in fact the caſe with the mind. When an object which we have once perceived is moſt remote from our thoughts, we are certain that there is within us a capacity, diſpoſition, tendency, or power, by which a repreſentation of that object may be at any time revived and preſented to the intellect. Thus the ſame inherent power of the mind and its internal organs, which retains a ſenſation and perception in the abſence of the object by which they were excited, can alſo reproduce that perception, or bring into the view of the intellect ſomething exactly ſimilar to it. The reproduction will not indeed be ſo lively as the original perception when accompanied with its correſponding ſenſation, becauſe ſenſation and actual perception are effected by a double cauſe, the action of the external object upon the organ, nerves, and brain, and the correſponding energy of the mind or ſentient principle: whereas, in the reproduction, the mind ſeems to act ſolely by its own power, and certainly without the aſſiſtance of external objects. This reproductive power is commonly called *memory*. By many of the ancient philoſophers, and by *M. Schwab*, with one or two others among the moderns, it is called *imagination*. We do not chooſe either to revive antiquated modes of expreſſion, or to introduce innovations of our own; but as we cannot diſapprove of the ancient phraſeology, after the definitions which the reader will by and by find of *imagination*, *memory*, and *recollection*, as given by Mr Harris, we have prefixed to this chapter the general title of *retention* which comprehends them all.

* See An Eſſay on the Reduction of the Faculties of the Mind, by M. Schwab.

56 The opinions of philoſophers reſpecting memory.

When one recals an object of ſight by the power of memory, it appears to him preciſely the ſame as in the original ſurvey, only leſs diſtinct, and with a conviction (which is perhaps the reſult of experience) that the real object is not immediately before him. How is an object recalled by the power of memory? Does the man endeavour to form in his mind a picture or repreſentative image of the object? Let us liſten to the anſwers given by different philoſophers to this queſtion.

The Peri- [illegible] Plato[illegible]

The ſentiments of the Peripatetics, as expreſſed by *Alexander Aphrodiſienſis*, one of the earlieſt commentators on *Ariſtotle*, are thus tranſlated by Mr Harris in his Hermes.—"Now, what fancy or imagination is, we may explain as follows: We may conceive to be formed within us, from the operation of the ſenſes about ſenſible ſubjects, ſome impreſſion (as it were), or picture in our original ſenſorium, being a relict of that motion cauſed within us by the external object; a relict which, when the external object is no longer preſent, remains, and is ſtill preſerved, being as it were its image; and which, by being thus preſerved, becomes the cauſe of our having memory. Now ſuch a ſort of relict, and (as it were) impreſſion, they call *fancy* or *imagination* (E)." A paſſage from ALCINOUS *of the doctrines of Plato*, as rendered into Engliſh by Dr Reid †, ſhows, that in this theory, as in that of perception, the Platoniſts agreed with the Peripatetics. "When the form or type of things is imprinted on the mind by the organs of the ſenſes, and ſo imprinted as not to be deleted by time, but preſerved firm and laſting, its preſervation is called *memory*."

† Eſſays on the Intellectual Powers of Man.

Mr Harris, who was deeply read in the ancient philoſophy, and who conſidered the authority of Ariſtotle and Plato as ſuperſeding all reaſoning and all inquiry, after juſtly obſerving, that if the ſoul had no other faculties than the ſenſes it could never acquire the leaſt idea of *time*, thus expreſſes himſelf on the ſubject before us:—"But happily for us we are not deſerted here. We have, in the firſt place, a faculty called *imagination* or *fancy*; which, however as to its *energies* it may be ſubſequent to ſenſe, yet is truly prior to it both in *dignity* and *uſe*. This it is which *retains the fleeting forms of things*, when things themſelves are gone, and *all ſenſation* is at an end. That this faculty, however connected with ſenſe, is ſtill perfectly different, may be ſeen from hence. We have an *imagination* of things that are gone and extinct; but no ſuch things can be made objects of *ſenſation*. We have an eaſy command over the objects of our *imagination*, and can call them forth in almoſt what manner we pleaſe, but our *ſenſations* are neceſſary when their objects are preſent, nor can we control them but by removing either the objects or ourſelves. As wax would not be adequate to its buſineſs of ſignature, had it not a power to retain as well as receive; the ſame holds of the SOUL, with reſpect to *ſenſe* and *imagination*. SENSE is its *receptive* power; IMAGINATION its *retentive*. Had it ſenſe without imagination, it would not be as wax but as water; where, though all impreſſions may be inſtantly made, yet as ſoon as made they are entirely loſt. Thus then, from a view of the two powers taken together, we may call SENSE (if we pleaſe), *a kind of tranſient imagination*; and IMAGINATION, on the contrary, *a kind of permanent ſenſe*."

58 diſtinguiſh properly between imagination and memory, &c.

Great part of the office which is here given to imagination, is in common Engliſh attributed to memory; but between theſe two faculties, as well as between them and recollection, the author accurately

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(E) The original is as follows: Τι τοινυν εστιν ἡ φαντασια ωδε αν γνωρισαιμεν δει νοειν εν ημιν απο των ενεργειων των περι τα αισθητα, οιον τυπον τινα αναζωγραφημα εν τω πρωτω αισθητηριω, εγκαταλειμματι της υπο του αισθητου γινομενης κινησεως, ὁ και μηκετι του αισθητου παροντος, υπομενει τε και σωζεται, ον ωσπερ εικων τις αυτου, ο και της μνημης ημιν σωζομενον αιτιον γινεται το τοιουτον εγκαταλειμμα, και τον τοιουτον ωσπερ τυπον, φαντασιαν καλουσιν. *Alex. Aphrod. de Anima*, p. 135. *Edit. Ald.*

diſtinguiſhes thus:—"When we view ſome *relict* of ſenſation repoſed within us, *without thinking of its riſe*, or *referring it to any ſenſible object*, this is FANCY OR IMAGINATION. When we view ſome ſuch *relict*, and *refer it withal to that ſenſible object which in time paſt was its cauſe and original*, this is MEMORY. Laſtly, the *road which leads to memory through a ſeries of ideas however connected, whether rationally or caſually*, this is recollection."

59 Objections to their theory.

Of this theory we ſhall only remark, that if we could underſtand the words *picture* and *form* in a metaphorical ſenſe, as candor obliges us to underſtand Locke's *images* in the mind, the doctrine of *Alexander Aphrodiſienſis* would be very little wide of the truth. Experience teaches us that memory as well as perception depends upon the ſtate of the brain; and as it is undeniable, that when a man to day contemplates an object which he perceived yeſterday, or at any former period, he has a view of it in all reſpects ſimilar to the original perception, only fainter and leſs diſtinct, it is extremely probable, that an impreſſion *ab extra*, which produces a ſenſation and perception, leaves behind it ſome *tendency* in the brain, to vibrate as in the actual ſenſation, and that this *tendency* is carried into *effect* by the internal energy of the mind itſelf. But in the Peripatetic philoſophy, *pictures* and *forms* in the *ſenſorium* were conſidered as real things, and by no means as metaphorical expreſſions. This is evident from their being conſtantly compared to the impreſſion of a ſeal upon wax and from their converting the *materia prima* from ſomething, which can neither be ſeen nor felt, into viſible and tangible body, of which we ſhall treat afterwards. Now it being certain that on a being immaterial, no corporeal *form* can be impreſſed, and repeated diſſections having ſhown that no ſuch forms are in fact impreſſed on the brain, this whole theory is at once overturned.

[59] Locke's doctrine concerning memory

Modern philoſophers having denied that there are real *images* or *forms* in the mind during the immediate act of perception, cannot conſiſtently with themſelves admit ſuch images in the act of retention, or when thoſe things which were formerly objects of perception are recalled to the mind by the power of memory. Mr Locke's doctrine is, that "the mind retains theſe ſimple ideas which it firſt received from ſenſation or reflection, two ways: firſt, by keeping the idea, which is brought into it, for ſome time actually in view, which is called CONTEMPLATION: and ſecondly, by the power which we have to revive again in our minds thoſe ideas, which, after imprinting, have diſappeared, or have been, as it were, laid out of ſight; as when we conceive heat or light, yellow or ſweet, the object being removed. This (he ſays) is MEMORY; which is, as it were, the ſtore-houſe of our ideas †.

To explain this more fully, he immediately adds the following obſervation:—"But our ideas being nothing but actual perceptions in the mind, which ceaſe to be any thing when there is no perception of them, this laying up of our ideas in the repoſitory of the memory, ſignifies no more but this, that the mind has a power, in many caſes, to revive perceptions which it has once had, with this additional perception annexed to them, that it has had them before. And in this ſenſe it is, that our ideas are ſaid to be in our memories, when indeed they are actually nowhere; but only there is an ability in the mind, when it will, to revive them again, and, as it were, paint them anew on itſelf, though ſome with more, ſome with leſs difficulty, ſome more lively and others more obſcurely. And thus it is, by the aſſiſtance of this faculty, that we are ſaid to have all thoſe ideas in our underſtandings, which, though we do not actually contemplate them, yet we can bring in ſight, and make appear again, and be the objects of our thoughts, without the help of thoſe ſenſible qualities which firſt imprinted them there."

To attempt a defence of the accuracy of this language would be vain; but as the author's meaning is ſufficiently obvious, his expreſſions may be eaſily and certainly corrected. Had Locke ſaid—"But our ideas being nothing but ſcenes or appearances in the mind, which ceaſe to be any thing when there is no perception of them, this laying up of our ideas in the repoſitory of the memory ſignifies no more but this, that the mind has a power, in many caſes, to revive ſcenes which it has once viewed, with this additional perception annexed to them, that it has viewed them before;" there would have been no room for the many petulant remarks which have been made upon the paſſage.

60 Objected to.

But againſt this account of memory, a much heavier charge has been brought than that which regards the propriety of the language. It has been ſaid, that the additional perception, which, according to Locke, attends the revival of our ideas by the power of memory, "would be a fallacious perception, if it led us to believe that we had them before, ſince they cannot have two beginnings of exiſtence: nor can we believe them to have two beginnings of exiſtence; we can only believe that we had formerly ideas or perceptions very like to them, though not identically the ſame." Let us examine this queſtion ſomewhat narrowly: for if it be really true, that in the ſenſe in which the word *ſame* is here uſed, we cannot twice contemplate the ſame idea, all confidence in memory would ſeem to be at an end.

61 The objection obviated.

Suppoſe a man to ſtand on ſome of the riſing grounds about Edinburgh, the Calton-hill for inſtance, and from that eminence to view the glorious proſpect of the coaſt of Fife, the ocean, the frith of Forth, and the little iſlands ſcattered in the frith. Let him go away, and return next day to the ſame place, and look the ſame way: we would aſk whether he has the ſame *view* or *perception* which he had the day before? The man muſt ſurely be very captious who would ſay that he has not: and yet it is certain that the energy of mind by which he perceives on one day cannot be identically the ſame with that by which he perceived on another; nor are the rays of light which fall upon his eyes on the ſecond day, identically the ſame with thoſe which fell upon his eyes and occaſioned viſion on the firſt day. Let the ſame man now ſhut his eyes, and contemplate the various objects at which he had been juſt looking. They will appear to him in all reſpects the ſame as when viewed by means of his organs of ſight, only fainter and leſs diſtinct, with this additional conviction, that the immediate objects of his preſent contemplation are not real external things, but *ideas* or *mental repreſentations* of thoſe things which had ſo lately been the objects of his ſight. Let him think no more about the matter for ſome days, and then exert his power of memory. We have no heſitation to ſay, that in the ſenſe of the word *ſame*, as uſed by Mr Locke, the very ſame ideas will recur and be preſent to his intellect which were preſent to it at the former contemplation. The ſecond energy of memory or imagination, or whatever it may be called, is not indeed identically the ſame with the firſt; nor is that agitation or motion, or whatever other affection of the brain is neceſſary to memory, identically the ſame at the ſecond time as at the firſt: but the mind exerting itſelf in the very ſame manner at the one time as at the other, produces the ſame kind of agitation in the brain, and is itſelf affected in the very ſame way at the ſecond as at the firſt exertion. Whence it follows, that the ſecond *ideal ſcene* will be as much the ſame with the firſt, as the ſecond *actual perception* is the ſame with the firſt; and the two ideal ſcenes, and the two actual perceptions, are reſpectively ſaid to be the ſame with each other, only becauſe they impreſs the mind with a conviction that they were occaſioned by the ſame external objects.

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† Eſſay, Book ii. chap. 10.

But though we think Locke's doctrine, with reſpect to memory, may be thus eaſily vindicated from the charge of fallacioufneſs, we muſt acknowledge that to us it appears not to be of much value. It teaches nothing, but that the mind has a power to retain ideas of thoſe objects which it formerly perceived, and in many inſtances to recal them as occaſion may require. But theſe are truths known to all mankind, to the clown as well as to the philoſopher.

62 The opinion of Hume.

Philoſophers in general have paid leſs regard to the retentive faculties of the mind than to its original powers of perception. Perhaps they imagined, that as memory depends upon perception, and in ſome reſpects appears to reſemble it, a competent knowledge of the nature of the former faculty would lead to that of the ſecond. Be this as it may, Mr Hume, who was at ſome pains to detail his notions of perception, has in his Philoſophical Eſſays only dropt concerning memory and imagination a few hints, ſo looſely thrown together, that, if he had not elſewhere expreſſed himſelf with more preciſion, it would have been difficult to diſcover his real meaning. According to him, that which is commonly called the *perception of an external object*, is nothing but a ſtrong impreſſion upon the mind; and that which is called the *remembrance of a paſt object*, is nothing but a preſent impreſſion or idea weaker than the former. Imagination is an idea weaker than the idea or impreſſion which he calls *memory*. This ſeems to be a wonderful abuſe of language. Impreſſions are not perceptions; and, if poſſible, they can ſtill leſs be called *ideas*, which are but ſecondary perceptions. It is likewiſe far from being true, that an idea of imagination has neceſſarily leſs vivacity than an idea of memory. We have ſeen Mr Hume, and have at the preſent moment an idea of his form and dreſs: we can likewiſe imagine to ourſelves a centaur; and though a centaur was never ſeen, and therefore cannot be *an impreſſion retained by memory*, our idea of the monſter is much more lively and diſtinct than that of the philoſopher.

63 Of Dr Reid.

Dr Reid having obſerved of memory [*], that it is by it we have an immediate knowledge of things paſt; that it muſt have an object; that in this reſpect it agrees with perception, but differs from ſenſation, which has no object but the feeling itſelf; and that every man can diſtinguiſh the thing remembered from the remembrance of it—proceeds to inquire what memory is? And, "Firſt (ſays he), I think it appears that memory is an original faculty given us by the Author of our being, of which we can give no account but that we are ſo made. The knowledge (continues he) which I have of things paſt by my memory, ſeems to me as unaccountable as an immediate knowledge would be of things to come (F); and I can give no reaſon why I ſhould have the one and not the other, but that ſuch is the will of my Maker. I find in my mind a diſtinct conception and a firm belief of a ſeries of paſt events; but how this is produced I know not. I call it *memory*; but this is only giving a name to it; it is not an account of its cauſe. I believe moſt firmly what I diſtinctly remember; but I can give no reaſon of this belief. It is the inſpiration of the Almighty which gives me this underſtanding. When I believe the truth of a mathematical axiom or of a mathematical propoſition, I ſee that it muſt be ſo: every man who has the ſame conception of it ſees the ſame. There is a neceſſary and an evident connection between the ſubject and the predicate of the propoſition; and I have all the evidence to ſupport my belief which I can poſſibly conceive. When I believe that I waſhed my hands and face this morning, there appears no neceſſity in the truth of the propoſition. It might be or it might not be. A man may diſtinctly conceive it without believing it at all. How then do I come to believe it? I remember it diſtinctly. This is all I can ſay. This remembrance is an act of my mind. It is impoſſible that this act ſhould be, if the event had not happened? I confeſs I do not ſee any neceſſary connection between the one and the other. If any man can ſhow ſuch a neceſſary connection, then I think that belief which we have of what we remember will be fairly accounted for: but if this cannot be done, that belief is unaccountable; and we can ſay no more but that it is the reſult of our conſtitution. Our original faculties are all unaccountable: Of theſe memory is one. He only who made them comprehends fully how they are made, and how they produce in us not only a conception, but a firm belief and aſſurance, of things which it concerns us to know."

On this account of memory we ſhall make no remarks. There is a certain ſenſe of the words, in which every thing which the author has ſaid on the ſubject is undoubtedly juſt; and it would be very uncandid to take

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(F) If memory depends upon the ſtate of the brain as it has been affected in paſt perceptions, this appears to us a ſtrange poſition. Perhaps the excellent author means nothing more, than that it is as unaccountable to us, that impreſſions on the brain ſhould cauſe perception, and the veſtiges of theſe impreſſions ſhould cauſe remembrance, as how the mind might not perceive things to come without the intervention of impreſſions on the brain. If this be his meaning, no man will controvert it: for it is impoſſible to diſcover the nature of that relation which ſubſiſts between an impreſſion and perception; but that there is ſuch a relation, we know from experience.

[*] Eſſays on the Intellectual Powers of Man.

Retention and Ideas.

take his words in any other ſenſe. But though memory, as it is the reſult of that conſtitution which was given us by God, and not the offspring of habit or human contrivance, is unqueſtionably an original faculty; and though it is therefore impoſſible to account for it ſo fully as to ſilence every inquiry which may be made; yet we could wiſh that Dr Reid had beſtowed a little more pains upon it, in order to diſcover if poſſible in what reſpects it reſembles or differs from perception. He has well obſerved, that there are laws of nature by which the operations of the mind are regulated, as well as laws of nature which govern the material ſyſtem. As the latter are the ultimate concluſions which the human faculties can reach in the philoſophy of bodies, ſo the former are the ultimate concluſions which we can reach in the philoſophy of minds. The more general that theſe laws are in both caſes, the more uſeful they are and the more ſatisfactory: for as they are themſelves inexplicable, the fewer they are in number, and the more comprehenſive each, the fewer will thoſe phenomena be for which we can give no account. Thus, as we know not what makes the planets tend to the centre of the ſun, or heavy bodies tend to the centre of the earth, we can give no other account of theſe phenomena, but that, as they appear to be of the ſame kind, it is reaſonable to conclude that they proceed from ſimilar cauſes. What the cauſe is of this tendency of bodies towards each other, we know not. We call it *gravitation*, and employ it to account for all phenomena of the ſame kind. In like manner it is univerſally allowed, that as we know not how mind and matter operate upon each other, there is ſomething in perception wholly unaccountable. That perception follows ſenſation; and that there is no ſenſation which is not occaſioned by ſome affection of the brain, proceeding from ſome impreſſion *ab extra*; we have the evidence of experience: but how a particular affection of the brain ſhould excite a ſenſation in the mind, we know not; though we may here, as in the corporeal ſyſtem, attribute ſimilar effects to the ſame or ſimilar cauſes. Thus, if when we exert an act of memory we have the ſame appearance of things as in the original act of perception, the rules of philoſophiſing authoriſe us to refer both phenomena to the ſame general law; juſt as they authoriſe us to refer the motion of the planets and of projectiles to the ſame general law. On the other hand, if we perceive no ſimilarity between memory and perception, we have made no progreſs in the philoſophy of mind; for in that caſe we have diſcovered two phenomena proceeding from two cauſes totally different from each other, and both inexplicable. Although we ſcarcely hope to throw any light upon a ſubject which Dr Reid has not attempted to illuſtrate, we ſhall ſtate a few facts reſpecting the memory, and ſubmit to the reader the concluſions to which we think theſe facts lead.

64
The appearance of ſenſible objects when recalled by the power of memory.

1. Objects once perceived by the ſenſes, when recalled to the mind by the power of memory, appear preciſely the ſame as in the original perception, only leſs diſtinct*. For example, having ſeen yeſterday a ſpreading oak growing on the bank of a river, and having heard a ſhepherd play, and handled a ſquare ſtone, we endeavour to recal to our minds theſe objects which are now abſent. How is this operation performed? Do we endeavour to form in our minds pictures of them or repreſentative images? or, does our intellect ſurvey the types or forms which, according to Ariſtotle, thoſe objects left in the imagination when originally perceived; Neither of theſe things is done. We conceive ourſelves as ſtanding in the ſame place where we ſtood yeſterday; upon which we have perceptions of the objects ſimilar in all reſpects to the perceptions which we had when we employed our eyes, our ears, and our hands. The tree appears, as it were, before us; faint indeed, but attended with all the objects which we obſerved around it yeſterday: we ſeem to hear the ſound of the pipe confuſedly, and at a diſtance; to move our hands over the ſtone, and to feel the ſame ſurfaces and the ſame angles which we felt in the original perception. In this recollection we are not conſcious of pictures or images more than in the original ſurvey. The perceptions ſeem to be of the tree and river themſelves, of the ſound itſelf, and of the ſtone itſelf, exactly as at the firſt; and yet we are ſatisfied that in the act of remembrance we perceive no ſuch object as a *real* tree, pipe, or ſtone. That theſe are facts, every man muſt be convinced who attends to the energies of his own mind when exerting the powers of retention: and therefore it is, in our opinion, with no impropriety that Mr Harris ſays, we may call SENSE, if we pleaſe, *a kind of tranſient imagination*; and IMAGINATION, on the contrary, *a kind of permanent ſenſe*: for if theſe two faculties, as far as the mind or intellect is concerned, be not the ſame, they ſeem to reſemble each other much.

65
What ideas remain longeſt in the memory.

2. The *primary* preception of a *viſible* object is more complete, lively, and diſtinct, and remains longer in the *ſenſorium*, than that of any other object. We know likewiſe by experience, that an *idea* or *ſecondary* perception of a viſible object is as much more complete, lively, and diſtinct, than the idea of any other object, as was the *primary* perception; and that we remember things which we have ſeen for a longer time than ſounds which we have heard, or than tangible objects which we have only handled. Yet there ſeems to be a conſtant decay of all our ideas, even of thoſe which are ſtruck (G) deepeſt and in minds the moſt retentive; ſo that if they be not frequently renewed by repeated exerciſe of the ſenſes, or by reflection on thoſe objects which at firſt occaſioned them, the print (G) wears out, and at laſt there remains nothing to be ſeen. Concerning ideas, it is eaſy to remark, that thoſe remain longeſt and cleareſt in the memory which are derived from two or more ſenſes, eſpecially if the ſenſe of ſight be one of the number, or which are ofteneſt refreſhed by a return of the objects which produced them. Hence a man has a longer and more diſtinct

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* Appendix to Elements of Criticiſm.

(G) Theſe expreſſions, which mention ideas as things which are *deep ſtruck*, and as *prints which wear out*, are the expreſſions of Locke. We hope it is needleſs to warn our readers, that they are uſed by us as they were by him in a metaphorical ſenſe. On theſe ſubjects it is impoſſible to write without metaphor; which, while the meaning is obvious, no man will condemn, who reflects that the words of language were not invented by metaphyſicians, and are for the moſt part *literally* ſignificant only of ſenſible objects.

remembrance of what he has ſeen than of what he has only heard, of what he has both ſeen and felt than of what he has only ſeen; and the ideas which we have of heat and cold, of hunger and thirſt, and of all theſe things which moſt frequently affect our ſenſes, are extremely clear, and are never quite loſt whilſt the mind retains any ideas at all.

66
Memory a kind of habit.

2. Memory appears to be a kind of habit, which is not always in exerciſe with regard to things we remember, but is ready to ſuggeſt them when there is occaſion. The moſt perfect degree of this habit is when the thing preſents itſelf to our remembrance ſpontaneouſly, and without labour, as often as there is occaſion. A ſecond degree is, when the thing is forgotten for a longer or ſhorter time, even when there is occaſion to remember it, and yet at laſt ſome incident, ſuch as a violent paſſion *, which agitates the whole mind and ſenſorium, tumbles the idea, as it were, out of its dark corner, and brings it into view without any ſearch. A third degree is, when we caſt about and ſearch for what we would remember, and after ſome labour find it out. This ſearching faculty of the ſoul is by Ariſtotle called αναμνησις, by Dr Reid and others *reminiſcence*, and by Mr Harris *recollection*. Should it be ſaid, that what we *will* to remember we muſt already conceive, as we can will nothing of which we have not a conception; and that therefore, a *will* to remember a thing, ſeems to imply that we remember it already—we anſwer, with Dr Reid, that when we will to remember a thing, we muſt indeed remember ſomething relating to it; but we may have no poſitive idea or conception of the thing itſelf, but only of the relation which it bears to that other thing which we do remember. Thus, one remembers that a friend charged him with a commiſſion to be executed at ſuch a place, but he has forgotten what the commiſſion was. He applies himſelf to diſcover it; and *recollects* that it was given by *ſuch a perſon*, upon *ſuch an occaſion*, in conſequence of ſuch a *converſation*: and thus by a train of thought he is led to the very thing which he had forgotten and wiſhed to remember. To this operation it is not always neceſſary that the relations between the various ideas which the mind turns over be very cloſe, or have their foundation in nature; for a caſual connection is often ſufficient. Thus, from ſeeing a garment, we think of its owner; thence of his habitation; thence of woods; thence of timber; thence of ſhips; thence of admirals; thence of cannons, iron, furnaces, and forges, &c."

67
In recollection one idea ſuggeſts another, and why.

That in the proceſs of recollection, one idea ſhould ſuggeſt another, may be eaſily accounted for. When, in perception, our minds are expoſed to the influence of external objects, all the parts and properties, and even the accidental variable adjuncts of theſe objects, are perceived by full-grown men at the ſame time; ſo that the whole group makes but one impreſſion upon our organs of ſenſe, and conſequently upon the mind. By theſe means all the parts of the ſimultaneous impreſſion †, and conſequently of the perception occaſioned by that impreſſion, are ſo intimately aſſociated or linked together, that the idea of any one of them recurring at any future period generally introduces the ideas of all the reſt. But as the neceſſary parts and properties of any thing are more cloſely linked together, and occur more frequently than any particular variable adjuncts, it is obvious, that by the idea of any one of theſe properties, the idea of the reſt, and of the object itſelf, will be more readily introduced than by the idea of any variable adjunct. It ſeems, however, to be certain, that we have no power of calling up any idea at pleaſure, but only ſuch as have a connection, either in nature or by means of former aſſociations, with thoſe that are at any time preſent to the mind. Thus the ſight, or the idea, of any particular perſon, generally enables us to recollect his name, becauſe his name and his perſon have been conſtantly aſſociated together. If that fail to introduce the name, we are at a loſs and cannot recollect it at all till ſome other aſſociated circumſtance helps us. In naming a number of words in a ſentence, or lines in a poem, the end of each preceding word or line being connected with the beginning of the word or line which ſucceeds it, we can eaſily repeat them in that order; but we are not able to repeat them backwards with any eaſe, nor at all till after many fruitleſs efforts. By frequent trials, however, we acquire at laſt a facility in doing it, as may be found by making the experiment on the names of number from one to twenty. It is, indeed, probable, that in the wildeſt flights of *fancy*, no ſingle idea occurs to us but ſuch as had a connection with ſome other idea, perception, or notion, previouſly exiſting in the mind, as ſhall be ſhewn more fully in a ſubſequent chapter.

68
Memory depends on the ſtate of the brain.

4. "Memory appears to depend entirely or chiefly upon the ſtate of the brain *. For diſeaſes, concuſſions of the brain, ſpirituous liquors, and ſome poiſons, impair or deſtroy it; and it generally returns again with the return of health, from the uſe of proper medicines and methods. It is obſervable, too, that in recovering from concuſſions and other diſorders of the brain, it is uſual for the perſons to recover the power of remembring the then preſent common incidents for minutes, hours, and days, by degrees; alſo the power of recalling the events of his life preceding his illneſs. At length he recovers this laſt power perfectly; and at the ſame time forgets almoſt all that paſt in his illneſs, even thoſe things which at firſt he remembered for a day or two. Now the reaſon of this ſeems to be, that upon a perfect recovery the brain recovers its natural ſtate, and all its former affections and tendencies; but that ſuch affections or tendencies as took place during the preternatural ſtate, *i. e.* during the patient's illneſs, are obliterated by the return of the natural ſtate." All this we are induced to believe; becauſe, though it is a fact incontrovertible, that in certain diſeaſes the memory is impaired, and recovers its vigour with the return of health, it is not conceivable that the mind itſelf ſhould ſuffer any change by diſeaſes, concuſſions, or ſpirituous liquors, &c.

From theſe facts we are ſtrongly inclined to conclude, that the power of the *mind* or *immaterial* (H) *principle*

* Reid's Eſſays on the Intellectual Powers of Man, Locke's Eſſay, &c. and Harris's Hermes.

† Hartley on Man.

* Hartley on Man.

(H) Through the whole of this and the preceding chapters, we have taken it for granted that the ſentient principle in man is not material. This is the *common*, and, as ſhall be ſhown afterwards, the moſt *probable* opinion; but whether it be abſolutely certain or not, makes no difference on the theories of ſenſation and perception. Theſe are obviouſly neither figure nor motion, and therefore not ſubject to the laws which govern the material world.

69 External objects operating on the ſenſes leave ſome permanent effect in the brain.

ciple, by which it remembers paſt events, differs not from that by which it perceives preſent objects. In perception, impreſſions are made upon the organs of ſenſe, which are communicated to the brain; and, by ſome unknown means, occaſion ſenſations which are followed by the perception of the external object. When by the power of memory we recal paſt objects of ſenſe, the mind has the ſame view of them as in the original perception, except that they appear fainter, leſs diſtinct, and generally more diſtant. We have, therefore, reaſon to conclude, that in the act of remembrance the brain is affected in the ſame way, though not ſo forcibly, as in perception. That memory depends as much as perception upon the ſtate of the brain, is confirmed by daily experience; and therefore there cannot be a doubt but that external objects, operating upon the ſenſes, nerves, and brain, leave ſome permanent effect behind them. What that effect preciſely is we cannot know, and we need not deſire to know; but that they leave *ſome* effect we have as good evidence as that the planets are moved round the ſun by forces of the ſame kind with thoſe by which projectiles are moved on the earth. Could we ſuppoſe that they leave real *prints* or *impreſſions* behind them, which we confeſs to be very little probable, memory would ſeem to be nothing but the perceptive power of the mind turned to thoſe impreſſions. If the permanent effect of impreſſions by external objects be, as Dr Hartley ſuppoſes, only a tendency in the brain to vibrate as in the original perception, remembrance will reſult from the mind's operating upon the brain as in actual perception; and the reaſon that ideas of memory are fainter than perceptions of ſenſe, is, that the former are produced by a ſingle, and the latter by a double, operation.

70 Why the memory advances to perfection, and then gradually decays.

This theory appears to be greatly confirmed by the following well-known facts, that children ſoon commit to their memory any thing which they underſtand, and as ſoon forget it; that the powers of memory gradually advance to perfection, and then gradually decay; and that old men remember more diſtinctly what they perceived in their youth, than what they perceived a year ago. For if the memory belonged wholly to the pure intellect, and had no dependence upon the brain, it is not eaſy to conceive how it ſhould advance towards a ſtate of perfection and afterwards decay. A being which is unextended and indiviſible, can ſuffer no change either in its eſſence or in its faculties: the ideas which it had once retained, it would retain forever. But if memory be occaſioned by ſome relict of ſenſe left in the brain, it is eaſy to ſee how all thoſe changes ſhould take place: and therefore, though we have the weight of Dr Reid's authority againſt us, we cannot help thinking that Ariſtotle was in the right, when he imputed the ſhortneſs of memory in children to this cauſe, that their brain is too moiſt and ſoft to retain impreſſions made upon it; and that he was likewiſe in the right, when he imputed the defect of memory in old men to the hardneſs and rigidity of the brain, which hinders it from receiving any durable impreſſion.

Another argument to prove, that in remembrance the mind acts upon ſomething left in the brain by the impreſſions of ſenſe, is this, that nothing can act but where it is preſent. The truth of this axiom is acknowledged by Dr Reid, and we believe by all mankind except Dr Prieſtley and one or two others, whoſe paradoxes we ſhall conſider afterwards. Now it is confeſſed, that in recollection at leaſt the mind is active; and therefore it muſt act, *not* upon an object which has now perhaps no exiſtence, and certainly no immediate exiſtence, *but* upon ſomething left by that object in the brain or ſenſorium, to which the mind is intimately preſent.

71 By what means we never confound memory with perception.

But if this be ſo, we may be aſked how it comes to paſs that men never confound memory with perception, nor fancy that they perceive things which they only remember? If perception be an inference drawn from certain ſenſations excited by an impreſſion on the brain, and if remembrance reſult from the mind's operating upon relicts of thoſe impreſſions, one would think it natural to ſuppoſe, that in both caſes we have actual perceptions, though in the one caſe the perception muſt be more vivid and diſtinct than in the other. To this we anſwer, That previous to all experience, perception and memory are very probably confounded; and that we believe a man brought into the world with all his faculties in their full *natural* perfection, would not inſtantly be able to diſtinguiſh what he remembered from what he perceived. This we know to be the caſe with reſpect to imagination, a faculty which ſtrongly reſembles memory; for in dreams, and ſometimes even in waking reveries, we fancy that we actually perceive things which it is certain we can only imagine. A very ſhort experience, however, would enable this newly created man to make the proper diſtinction between remembrance and perception. For let us ſuppoſe him to be brought into a dark room, and ſoon afterwards a candle to be introduced. The candle would give him a viſible ſenſation, though not at firſt the perception of an external object. Let the candle after ſome time be carried out: the man would retain a viſible *idea*, which he might confound with the actual ſenſation. But if, whilſt this idea remained in his mind, the candle were brought back, he would inſtantly feel a difference between the real ſenſation and the idea, when both were together preſent to his mind. And having, in ſome ſuch manner as we have already deſcribed, acquired the power of perceiving external objects by means of his ſenſes, he would ſoon diſcover, without any effort of his own, the difference between actual perceptions and the ideas treaſured up in his memory.

92 The order of ſucceſſion in which objects recur to the memory.

The only remaining difficulty which ſeems to encumber this theory of remembrance, is, to account for the order of ſucceſſion in which objects recur to the memory, and to which we give the name of *time*.—But this difficulty will vaniſh when we have aſcertained what *time* is. At preſent it is ſufficient to obſerve, that our perceptions of external objects remain a certain ſpace of time in the mind; that this time is different, according to the ſtrength and other circumſtances of the impreſſion which occaſioned the perception; and that traces of thoſe perceptions *i. e. ideas*, may be recalled after the intervention of other trains of ideas, and at very different intervals. If one look upon a houſe, and then ſhut his eyes, the impreſſion which it made upon his mind will not inſtantly vaniſh:

niſh: he can contemplate the houſe almoſt as long as he pleaſes; and, by the help of various aſſociated circumſtances, he may recal the idea ſeveral years afterwards and refer it to the original perception.

73
Brutes have memory, and

Before we diſmiſs the ſubject of retention, it may not be improper to take notice of the retentive powers of inferior animals. Ariſtotle, Locke, Dr Reid, and almoſt every philoſopher of eminence both among the ancients and moderns, have maintained, that inferior animals have memory as well as men; and indeed we do not perceive how the fact can be denied of the more perfect animals, and thoſe with whoſe operations we are beſt acquainted. A dog knows his maſter again after a long abſence; a horſe will trace back a road which he has but once travelled, often with more accuracy than his rider; and it is well known that many ſpecies of ſinging birds have a capacity to learn tunes from the human voice, and that they repeat the notes again and again, approaching nearer and nearer to perfection, till at laſt they ſing the tune correctly. Theſe phenomena can be accounted for only by ſuppoſing, that in the brains of the ſeveral animals traces are left by perception, of the ſame kind with thoſe which perception leaves in the brain of man and which are the cauſe or occaſion of his remembrance. With reſpect to this point, the learned author of *Ancient Metaphyſics* differs from his maſter Ariſtotle. He allows that brutes have imagination, but denies that they have memory: for (ſays he) "memory neceſſarily implies a ſenſe of *time*, and what is *firſt* and *laſt*; but brutes have no idea of time, or of firſt and laſt; and it is certain that they have not conſciouſneſs or reflection, by which only they could review their own operations. At the ſame time he admits, that imagination in the brute ſerves the purpoſe of memory in us; for whenever he ſees the object that is painted on his *phantaſia*, he knows it again, but without any perception of the time when he firſt ſaw it." But that a brute, when he ſees the object which is painted on his phantaſia, ſhould know it *again* without referring it to a former perception, is plainly impoſſible. The recogniſance of any thing conſiſts in a conſciouſneſs of its having been perceived before; and nothing more than ſuch recogniſance is eſſential to memory. The author's miſtake ſeems to lie in ſuppoſing that memory neceſſarily implies a ſenſe of ſome determinate portion of paſt time; but we ſurely remember many things of which we can only ſay that we have formerly perceived them, without being able to aſcertain the preciſe period at which we had ſuch perceptions. A child has the uſe of memory ſooner than he acquires the faculty of ſpeech; but he muſt have ſpoken and even reaſoned before he can have an accurate notion of time, which, as ſhall be ſhown afterwards, ariſes from comparing the fleeting ſucceſſion of our own ideas with the permanence of ourſelves and other objects. The author's diſtinction between memory and imagination ſeems to be on all accounts improper. Ariſtotle has ſaid, and ſaid truly, that there is memory of *ideas* as well as of ſenſible objects; meaning by ideas general conceptions or propoſitions: but this reviver of his philoſophy is inclined to ſay, "that *memory* is only of *ideas*, conſequently belongs only to man; and that *imagination* is only of ſenſible objects, and conſequently belongs both to man and brute."— But ſurely man *remembers* what he has *ſeen* and *felt* as well as what he has *conceived* or *thought*; and if imagination and memory be properly diſtinguiſhed by Mr Harris, the reverſe of this writer's doctrine muſt be true, viz. that imagination belongs only to *man*, and memory of ſenſible objects both to *man* and *brute*.— We can contemplate in imagination the idea of a *centaur* or a *golden mountain*; but we cannot be ſaid to remember them, for they were never perceived. That a dog can contemplate in his imagination the idea of a *centaur* or of a *golden mountain*, we have not the leaſt reaſon to ſuppoſe: but were he not capable of viewing relicts of ſenſe repoſed within him, and referring them to their original cauſes, he could not poſſibly recogniſe his maſter after a day's abſence.

74
the power of recollection.

Dr Reid and the ſame author agree with Ariſtotle, in thinking it probable that brutes have not reminiſcence, or the power of recollection: but there are many well atteſted facts which ſeem to prove the contrary. We ſhall mention one which fell under our own obſervation. One of the perſons concerned in this work was, when a young man, abſent for five months from the houſe of his father. Upon his return, a dog of that ſpecies which is commonly called the *ſhepherd's cur*, and which had been in the poſſeſſion of his father only a few months before his departure, gazed at him for a few minutes as at any other ſtranger. The animal then began to walk round him with looks which ſoon attracted his notice. This made him call the dog by the name which he bore in the family, and ſtretch out his hand to careſs him, when the creature inſtantly leaped upon him with all that appearance of attachment which thoſe animals ſo commonly exhibit upon the return of their maſter after a few days abſence. If this was not recollection, we ſhould be glad to know what it was, for we cannot diſtinguiſh it from recollection in men. Indeed, if dogs and ſome other animals poſſeſs, as Ariſtotle, Locke, and others, allow them to poſſeſs, the power of memory and ſomething of ratiocination; and if as Dr Reid expreſsly ſays *, "they expect events in the ſame order and ſucceſſion in which they happened before;" it is not conceivable that they can be wholly deſtitute of reminiſcence, or the power of recollection.

75
Memory capable of improvement.

That memory is a faculty of the firſt importance, cannot be denied; ſince it is obvious, that, without the power of retaining the ideas and notions which we receive by the ſenſes and other faculties, we never could make any progreſs in the acquiſition of knowledge, but ſhould begin every day, nay every hour, in the ſame ſtate of ignorance in which we were born. That it is a faculty capable of improvement by exerciſe, and that there are ſome methods of exerciſe better adapted for this purpoſe than others, has been ſhown elſewhere. See MEMORY.

CHAP. III. *Of* SIMPLE APPREHENSION *and* CONCEPTION.

76
Ideas of ſenſation the firſt materials of human knowledge.

THE ideas received into the mind by the ſenſes, and treaſured up in the memory and imagination, are the original materials of human knowledge. It is by comparing thoſe ideas with one another, or by analyſing them into their firſt principles, that we acquire all our knowledge in mathematics and philoſophy, and indeed all the knowledge which regulates our conduct through life. It muſt, therefore, be of importance to trace the progreſs of the mind in her various operations upon theſe materials; beginning as ſhe certainly begins, with that which is moſt ſimple, and proceeding regularly to thoſe which are more complex and difficult.

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* Eſſays on the Intellectual Powers of Man.

77
Simple apprehenſion of ideas

Now the firſt operation of the mind about her ideas appears plainly to be that which logicians term *ſimple apprehenſion*. Having yeſterday obſerved a *tree* or any other object, if we contemplate the idea of that tree to day as it remains in the imagination, without comparing it with any other idea, or referring it to any external object, we perform the operation which is called *ſimple apprehenſion*. We conſider ſimple apprehenſion as an *operation*, becauſe the mind in the apprehenſion of her own ideas is certainly active; ſhe turns them, as it were, round and round, and views them on every ſide.

78
Different from conception.

Simple apprehenſion is a phraſe which is commonly taken to be of the ſame import with the word *conception*; and in the ordinary affairs of life no confuſion can ariſe from an indiſcrimate uſe of the two words: but in this article we think it expedient to employ the phraſe *ſimple apprehenſion*, to denote the view or contemplation of thoſe ideas only which the mind by ſenſation has actually received from external objects; and the word *conception* to denote the view, not only of thoſe ideas, but alſo of ſuch as the mind fabricates to herſelf. Thus, a man may *conceive* a centaur, but we would not chooſe to ſay that he may *apprehend* a centaur: not that there is any impropriety, perhaps, in this laſt expreſſion; but as there is certainly a difference between *apprehending* the idea of what has been ſeen or felt, and *conceiving* that which never exiſted, perſpicuity requires that theſe different operations be expreſſed by different names.

79
In what ſenſe it is true that we can conceive objects which never exiſted.

We have ſaid that the mind may conceive what never exiſted; and every man may eaſily ſatisfy himſelf that what we have ſaid is true; but though this has been frequently called the creative power of the mind, it has in fact no reſemblance to *creation*. The materials of all our moſt complex and fantaſtic conceptions are furniſhed to our hands by ſenſation and reflection; nor can we form one ſimple idea which was not originally received by ſome of our ſenſes from external objects, or, as ſhall be ſhown afterwards, one intellectual notion which was not acquired by reflecting on the operations of our own minds. To explain the proceſs of fantaſtic conception, it is to be obſerved, that in every ſenſible object we perceive at once ſeveral things, ſuch as *colour*, *figure*, *extenſion*, and *motion* or *reſt*, &c. Theſe are the objects of different ſenſes: but they are not, at leaſt, by full grown men, perceived in ſucceſſion, but all at once; whence it comes to paſs that the memory, or the imagination, retains not ſeveral diſtinct and disjointed ideas, but the idea of *one coloured*, *figured*, and *extended object*. But when we compare various objects, or the ideas of various objects, together, we find that in ſome reſpects they agree and in others diſagree; *i. e.* that ſeveral objects affect ſome of our ſenſes in the ſame way, and other ſenſes differently. Thus one globe is black, and another white; one black ſubſtance is circular and hard, and another ſquare and ſoft. In the firſt inſtance, the two globes affect our ſenſe of touch in the ſame way, and our ſenſe of ſeeing differently; in the ſecond, the two black ſubſtances affect our ſenſe of ſight in the ſame way, and our ſenſe of touch differently.

From obſerving this difference among objects by means of the different ſenſations received from them, the mind learns to analyſe its original ideas, which are copies of thoſe ſenſations, into their firſt principles, and to combine thoſe principles in ſuch a manner as to form complex ideas of objects which we never actually perceived by the ſenſes. Of the ſimple and unmixed principles which compoſe thoſe complex ideas, there is not indeed one which was not originally received by ſome ſenſe; ſo that the whole difference between complex ideas fabricated by the mind, and thoſe which are the relicts of ſenſation, conſiſts in the order in which the conſtituent ſimple ideas of each are put together. Thus, no man ever ſaw a mountain of pure gold; and therefore the idea of ſuch a mountain can be in no human mind as a relict of ſenſation: but we have all ſeen pieces of gold of different ſizes, and we have all ſeen mountains; and nothing is more eaſy than to *conceive* a piece of gold extended on all ſides to the ſize of a mountain, and riſing out of the earth. Again, though no perſon ever ſaw a centaur, yet it is eaſy to *conceive* the upper parts of a man joined to the breaſt and ſhoulders of a horſe. In theſe inſtances, the complex conceptions are of things which it is in the higheſt degree probable never had a real exiſtence, and which it is certain we never *perceived* as exiſting: but the ſimple ideas of which they are compoſed are the relicts of actual ſenſations; for every one has perceived as really exiſting the body of a horſe and the upper parts of a man, and when conceiving a centaur he only perceives them to exiſt united. That we have not in the imagination one ſimple and unmixed idea which was not left there as a relict of ſenſe, every man will be convinced who ſhall try to conceive a ſimple colour or taſte which is totally different from all the colours and taſtes, and all the ſhades and varieties of them, which he has received by ſenſation; but his ſimple ideas, though all received from without, he may put together in numberleſs manners, differing from any order in which he has ever actually perceived the qualities of external objects exiſting.

80
This power of exception limited to poſſible exiſtence.

Yet even this power of the mind is limited. It is impoſſible to put together a number of *contrary* and *inconſiſtent* ideas, in ſuch a manner as to form of them one complex conception. No man, for inſtance, can conceive a thing to be at once white and black, round and ſquare, hard and ſoft, in motion and at reſt.—Hence it is a maxim among philoſophers almoſt univerſally received, that though we can conceive many things which never *actually* exiſted, yet we can form no ideas but of ſuch things as *might poſſibly exiſt*. A centaur never exiſted, but it may be conceived; for it is by no means impoſſible that the head of a man might be joined to the body of a horſe; but black ſnow cannot be *conceived*; for in the complex idea denoted by the word *ſnow* whiteneſs is an eſſential part, and nothing can be conceived to be both black and white at the ſame time. From this undoubted fact, that we cannot conceive impoſſible exiſtence, the power of conception has by ſome writers in certain inſtances been made a teſt of truth. "In every idea is implied (ſays

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(ſays Dr Price *) the poſſibility of the exiſtence of its object; nothing being clearer, than that there can be no ideas of an impoſſibility, or conception of what cannot exiſt." "It is an eſtabliſhed maxim in metaphyſics (ſays Hume), that whatever the mind conceives, includes the idea of poſſible exiſtence; or, in other words that nothing we imagine is abſolutely impoſſible ‡." In a word, it has been admitted by all philoſophers, from Pythagoras to Dr Reid, to be an axiom as evident and undeniable as any in Euclid, that whatever we can diſtinctly conceive is poſſible, though many things may be poſſible, nay, may really exiſt, of which we can form no conception.

81 The ſingular opinion of Dr Reid reſpecting our power of conception

This axiom has been denied by the author of the Eſſays on the Intellectual Powers of Man; who affirms, that "any two ſides of a triangle may be conceived to be equal to the third," as diſtinctly as "any two ſides of a triangle may be conceived to be greater than the third." This aſſertion from ſuch a man ſurpriſed us as much as any paradox which we ever read: for nothing is more certain, than that *we* ourſelves can form no conception of a triangle of which two of the ſides are only equal to the third. We can, indeed, reſolve the propoſition into its different parts, and form the diſtinct and independent ideas of a *triangle*, *two ſides*, and *one ſide*; and we can likewiſe form the general notion of *equality*: but to combine theſe ideas and this notion into one individual complex conception, we find to be abſolutely impoſſible. A man who knows nothing of triangles, if ſuch a man there be, might *believe* Dr Reid that it is a figure of which one of its ſides is equal to the other two; but ſuch a perſon would have no *conception* of the *figure itſelf*, but only a confidence in the Doctor's veracity.

82 controverted.

What is it to *conceive* a corporeal thing to exiſt? Is it not to fancy that we view it on all ſides, as what may be ſeen, or felt, or ſmelt, or taſted? The Doctor, indeed, repeatedly reprobates as the ſource of much error the notion of ideas as images in the mind; and if ideas be taken as real material figures, he is certainly in the right: But we appeal to the common ſenſe of mankind, whether every perſon who diſtinctly *conceives a triangle*, is not at the time conſcious that his mind is affected in a manner ſimilar, though not ſo forcibly, as when he actually views a triangle with his eyes? What other men may feel, they know beſt; but we are as certain that this is the caſe with reſpect to ourſelves, as we are certain of our own exiſtence. That this affection of the mind is occaſioned by ſome agitation in the brain, of the ſame kind with that which occaſions actual perception, is highly probable; but whatever be the cauſe, the fact is undeniable.

The Doctor's words indeed, taken by themſelves, would lead one to think, that by *conception* he means in this caſe nothing more than the underſtanding of the terms of a propoſition: but if that be his meaning, there was no room for controverſy; as the great philoſophers *Cudworth*, *Clarke*, *Price*, and *Hume*, whoſe opinion he is combating, would have been as ready as himſelf to allow, that when a man is thoroughly maſter of any language, he will find no difficulty in underſtanding the meaning of any particular words in that language, however abſurdly theſe words may be put together. When Dr Price ſays, that "in every idea is implied the poſſibility of the exiſtence of its object, nothing being clearer than that there can be no idea of impoſſibility or conception of what cannot exiſt," his meaning evidently is, that we cannot mentally contemplate or fancy ourſelves viewing any thing corporeal, which we might not actually view with our eyes, or perceive by ſome other ſenſe (1). This is the true meaning of *conception*, which is ſomething very different from underſtanding the ſeparate meaning of each word in a propoſition.

The learned profeſſor, however, appeals to the practice of mathematicians for the truth of his opinion; and if they be on his ſide we muſt give up the cauſe; for in no ſcience have we ſuch clear ideas, or ſuch abſolute certainty, as in mathematical reaſonings. But it is to be obſerved, that the word *conception* is with no propriety applied to *abstract truth*, but to *real* or *poſſible* exiſtence; nor can we be ſaid to conceive diſtinctly a *real* or *poſſible* object, unleſs we be able to turn it round and round, and view it on all ſides.—The faculties which are converſant about *abstract truth* are the judgment and the reaſon; and truth itſelf conſiſts in the agreement, as falſehood does in the diſagreement, of two or more ideas or terms compared together. If thoſe ideas about which the judgment is to be made can be immediately brought together, without the intervention of a third idea, it is impoſſible that we ſhould *judge*, or, if Dr Reid will have it ſo, *conceive* that to be *true* which is *really falſe*. If the two ideas cannot be immediately brought together, it is impoſſible that we ſhould form any *judgment* or *conception* at all about their *agreement* or *diſagreement*: but we may *ſuppoſe* or *admit*, for the ſake of argument, that they agree or diſagree; and if that ſuppoſition conduct to a manifeſt abſurdity, we then *know* that the ſuppoſition was falſe. It is, therefore, perfectly agreeable to the

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* Review of the principal Queſtions and Difficulties in Morals.

‡ Eſſays.

(1) Dr Price may be thought by ſome to have contradicted in this paſſage what he had aſſerted in a former. He is a ſtrenuous advocate for abſtract and general ideas even of material objects: but thoſe among the moderns who contend the moſt zealouſly for theſe, contend for them only as conceptions of the mind which can have no poſſible exiſtence out of it. Were this likewiſe the opinion of Dr Price, he would certainly have fallen into a direct contradiction; but this is not his opinion. His notion of abſtract ideas ſeems to be the ſame with that of Plato, who conſiders ideas not only as the poſſibilities of exiſtence, but as things actually exiſting from eternity, uncreated and independent even of the Supreme Mind. That Dr Price carries the matter thus far, we are unwilling to believe; but he certainly conſiders general ideas as real exiſtences independent of *our* minds, though the immediate objects of our underſtanding. That in this notion he is miſtaken, we ſhall endeavour to prove in the next chapter. It is enough for our preſent purpoſe to have ſhown that he does not contradict himſelf; and that he might with great propriety affirm on his own principles, as well as upon the principles of thoſe who admit not of univerſal ideas, that in every idea is implied the poſſibility of its object.

the maxim of Price and Hume, that mathematicians ſhould in many caſes prove ſome things to be poſſible and others impoſſible, which without demonſtration would not have been believed; becauſe if the ideas compared cannot be immediately brought together, no *judgment* previous to the demonſtration can be formed of the truth or falſehood of the propoſition; and if it concern not real or poſſible exiſtence, it is a propoſition with which *conception* has nothing to do.

"But (ſays Dr Reid) it is eaſy to *conceive*, that, in the infinite ſeries of numbers and intermediate fractions, ſome one number integral or fractional may bear the ſame ratio to another as the ſide of a ſquare bears to its diagonal." We are ſo far from thinking this an eaſy matter, that if the word *conceive* be taken in the ſenſe in which it is uſed by the philoſophers whoſe opinion he is combating, we muſt confeſs that we can form no adequate conception at all of an infinite ſeries. When we make the trial, we can only bring ourſelves to *conceive* the real numerical figures 1, 2, 3, &c. or the fractional parts $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, &c.; and even here our *conception* reaches but a ſmall way.—We have reaſon to believe, that minds of a larger graſp can conceive at once more of the ſeries than we can; and that the Supreme Mind conceives the whole of it, if the whole of a mathematical infinity be not a contradiction in terms: but ſurely no man will ſay that he can conceive an infinite ſeries as he conceives a centaur, and have an adequate and diſtinct view of it at once. If, by conceiving that in an infinite ſeries ſome one number may bear the ſame ratio to another that the ſide of a ſquare bears to its diagonal, the Doctor only means that ſuch a *ſuppoſition* may be made, his obſervation is not to the purpoſe for which it is brought; for the queſtion is not about our power to make ſuppoſitions of this kind, but about our power to raiſe in our imaginations an adequate and diſtinct mental view of poſſible or impoſſible exiſtence. "To ſuppoſe (ſays Johnſon), is to advance by way of argument or illuſtration, without maintaining the truth of the poſition." In this ſenſe a man may *ſuppoſe* that in an infinite ſeries there may be ſome one number which bears the ſame ratio to another that the ſide of a ſquare bears to its diagonal: but ſuch a ſuppoſition contains in it nothing that is *poſitive*, which conception always does; it is only admitting, for the ſake of argument, a poſition, of the truth or falſehood of which the perſon who makes the ſuppoſition knows nothing.—He is only talking of ratios as a blind man may talk of colours. A man born blind may be made to comprehend many of the laws of optics, and may make ſuppoſitions about colours, and reaſon from ſuch ſuppoſitions to a certain extent, as clearly and juſtly as one who ſees; but will any perſon ſay that a man blind from his birth can conceive *red* or *green?* It is much the ſame with reſpect to an infinite ſeries. We can follow ſuch a ſeries ſo far, and may know the ratio by which it increaſes or decreaſes, and reaſon from what we know with the utmoſt certainty: but no man ever *conceived the whole of an infinite ſeries* as he conceives an individual object; nor can any reaſonings upon the nature of it be applied to the queſtion of conceiving impoſſible exiſtence.

But "mathematicians often require us (ſays Dr Reid) to conceive things that are impoſſible, in order to prove them to be ſo. This is the caſe in all their demonſtrations *ad abſurdum*. Conceive (ſays Euclid) a right line drawn from one point of the circumference of a circle to another, to fall without the circle. I conceive this, I reaſon from it, until I come to a conſequence that is manifeſtly abſurd, and from thence conclude that the thing which I conceived is impoſſible." If it be indeed true, that Euclid deſires his readers to conceive a mathematical circle with a line drawn from one point of its circumference to another, and that line lying without the circle—if he really deſires them to form ſuch a complex conception as this, we have no heſitation to affirm, that he requires them to do what is manifeſtly impoſſible. The writer of this article has not in his cuſtody any copy of the elements in the original Greek, and therefore cannot ſay with certainty what are Euclid's words, nor is it of much importance what they be; for on a queſtion which every man may decide for himſelf, by looking into his own mind, the authority of Euclid is nothing.—The propoſition to which the Doctor refers, is the ſecond of the third book; and, in the edition of Simpſon is expreſſed thus: "If any two points be taken in the circumference of a circle, the ſtraight line which joins them ſhall fall within the circle." Every mathematician who can form an adequate conception of a circle and a ſtraight line, perceives the truth of this propoſition inſtantly, for it reſults neceſſarily from his conception; but he who has not an adequate conception of a circle, *may* ſtand in need of a demonſtration to ſhow him the truth: for it is to be obſerved, that demonſtration does not *make truth*; it only points it out to thoſe who cannot perceive it intuitively, juſt as a microſcope does not make the hairs on a mite's back, but only brings them within the field of viſion.

Were a man who never examined a mite through a microſcope, and who has no adequate ideas of the inſect kingdom, to be aſked whether there be hairs on a mite's back? he would probably anſwer that he did not know, but he could *conceive* no ſuch hairs. In like manner, were a man who has no adequate conception of a mathematical circle, to be aſked whether a ſtraight line, which joins any two contiguous points in the circumference, could lie *without* the circle? he would probably anſwer that he did not know. Now it is to be remembered, that the reader of the Elements can have no very adequate conception of a circle when he comes to the ſecond propoſition of the third book. The definition of a circle was indeed given him in the introduction to the firſt book: but of that definition he has hitherto had occaſion to make very little uſe, ſo that his idea of a circle will be little more accurate than that of an illiterate clown, who has no other idea of the figure than what he takes from a half-penny or a ſhilling. Dr Reid himſelf has elſewhere † well obſerved, that "when a youth of moderate parts begins to ſtudy Euclid, every thing at firſt is new to him. His apprehenſion is unſteady; his judgment is feeble; and reſts partly upon the evidence of the thing, and partly upon the authority of his teacher: but every time he goes over the definitions, the axioms, the elementary propoſitions, more light breaks in upon him; the language becomes familiar, and conveys clear and ſteady conceptions." In this ſtate he certainly

† See Lord Kames's Sketches of the Hiſtory of Man; Appendix to the firſt Sketch on the Sciences.

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tainly is when he reads for the firſt time the ſecond propoſition of the third book; his conception of a circle can then be neither clear nor ſteady. Our young geometrician however, muſt allow, that the propoſition is either true or falſe; and if he has read the preceding books with any advantage, he muſt have clear and ſteady conceptions of angles and triangles, and be able to demonſtrate many of their properties. "Well (ſays Euclid), though you have no adequate conception of a circle, you are well acquainted with plane angles and triangles, and many of their properties: let us ſuppoſe, if that be poſſible, that my propoſition is falſe, and I will ſhew you that the ſuppoſition is abſolutely inconſiſtent with what you know to be demonſtrable or ſelf-evident truth." This is all which Euclid can be ſuppoſed to require, when in the words of his excellent tranſlator, he ſays, "If it (viz. the ſtraight line) do not fall within (the circle), let it fall, if poſſible, without." He could not poſſibly deſire a man who has an adequate idea of a circle, to form the poſitive and complex conception of that figure, with a ſtraight line touching two points of the circumference, and yet lying on the outſide of the circumference; becauſe all his figures and lines are mere conceptions, and not real material things; and ſuch a requeſt would have been the ſame thing as if he had ſaid, Conceive what cannot be conceived (K).

We have inſiſted the longer on this point, becauſe we think it of the higheſt importance: for were it indeed true, that we could conceive impoſſible exiſtence, the conſequences would be very melancholy. Theſe conſequences it is needleſs to enumerate. Our readers will perceive, that if we could put together inconſiſtent ideas of ſenſible objects, and view them ſo united as one conſiſtent whole, nothing is clearer than that our faculties would be contrived to deceive us, and we would be doomed to cheerleſs and univerſal ſcepticiſm.

CHAP. IV. *Of* ABSTRACTION *and* GENERAL IDEAS.

83 Every ſenſible object and every idea are individual.

EVERY ſenſible object is an individual, and differs in many reſpects from every other object. As ſuch it is perceived by the ſenſes; and ideas being nothing more than relicts of ſenſation preſerved in the imagination or memory, every idea muſt of courſe be an individual, as much as the object to which it refers.

Of abſtraction and general ideas.

But all ſcience, whether mathematical, moral, or metaphyſical, is converſant about general truths; and if truth conſiſts, as we have already obſerved, and ſhall more fully evince afterwards, in the agreement or coincidence of ideas, how, it may be aſked, can general truth reſult from the compariſon of general ideas? To get rid of this difficulty, many philoſophers, both ancient and modern, pretend that the mind is furniſhed with *general ideas*, from a compariſon of which reſult general propoſitions applicable to many individuals. Philoſophers, indeed, have differed in opinion reſpecting the ſource of thoſe ideas; ſome of the ancients deriving them immediately from the ſupreme mind to the human, whilſt almoſt all the moderns ſay that they are framed by abſtraction, and therefore call them *abſtract ideas*.

84 The doctrine of abſtract ideas ſtated, and

The doctrine of *abſtract* ideas has been ſo fairly ſtated, and in our opinion, ſo completely overturned, by Biſhop Berkeley, that we ſhall content ourſelves with abridging what he has ſaid on the ſubject, and obviating ſome cavils which have lately been urged againſt his reaſoning. "It is agreed on all hands (ſays that learned and ingenious prelate †), that the qualities or modes of things do never really exiſt each of them apart by itſelf and ſeparated from all others; but are mixed, as it were, and blended together, ſeveral in the ſame object. But, we are told, the mind being able to conſider each quality ſingly, or abſtracted from thoſe other qualities with which it is united, does by that means frame to itſelf abſtract ideas. For example: There is perceived by ſight an object extended, coloured, and moved: this mixed or compound idea, the mind reſolving into its ſimple conſtituent parts, and viewing each by itſelf excluſive of the reſt, does frame the abſtract ideas of extenſion, colour, and motion. Not that it is poſſible for colour or motion to exiſt without extenſion; but only that the mind can frame to itſelf by *abſtraction* the idea of colour excluſive of extenſion, and of motion excluſive of both colour and extenſion. Again, the mind having obſerved that in the particular extenſions perceived by ſenſe, there is ſomething common and alike in all, and ſome other things peculiar, as this or that figure or magnitude, which diſtinguiſh them from one another; it conſiders apart, or ſingles out by itſelf, that which

† Introduction to the Principles of Human Knowledge.

(K) Principal Campbell, treating of the commonly received doctrine of abſtraction, and having ſhown, that though Locke has in one paſſage of his immortal work expreſſed himſelf on the ſubject in terms unintelligible, his ſentiments on the whole differed little from thoſe of Berkeley and Hume, adds—"Some of the greateſt admirers of that eminent philoſopher ſeem to have overlooked entirely the preceding account of his ſentiments on this ſubject; and, through I know not what paſſion for the paradoxical (I ſhould rather ſay the impoſſible and unintelligible), have ſhewn an amazing zeal for defending the propriety of the haſty expreſſions which appear in the paſſages formerly referred to. Has not the mind of man (ſay they) an unlimited power in moulding and combining its ideas? The mind, it muſt be owned, hath an unlimited power in moulding and combining its ideas. It often produces wonderful forms of its own out of the materials originally ſupplied by ſenſe; forms indeed of which there is no exemplar to be found in nature:—centaurs and griffins,

Gorgons and hydras, and chimeras dire.

But ſtill it muſt not attempt abſolute impoſſibilities, by giving to its creature contradictory qualities. It muſt not attempt to conceive the ſame thing to be black and white at the ſame time; to be no more than three inches long, and yet not leſs than three thouſand; to conceive two or more lines to be both equal and unequal; the ſame angle to be at once acute, obtuſe, and right;" or, we may add, the two ſides of a triangle to be not greater than the third. See *Philoſophy of Rhetoric*, vol. ii. p. 108, &c.

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which is common, making thereof a moſt abſtract idea of extenſion, which is neither line, ſurface, nor ſolid, nor has any figure or magnitude, but is an idea entirely preſcinded from all theſe. So likewiſe the mind, by leaving out of the particular colours perceived by ſenſe that which diſtinguiſhes them one from another, and retaining that only which is common to all, makes an idea of colour in abſtract, which is neither red, nor blue, nor white, nor any other determinate colour. And as the mind frames to itſelf abſtract ideas of qualities or modes, ſo does it by the ſame preciſion or mental ſeparation attain abſtract ideas of the more compounded beings, which include ſeveral coexiſtent qualities. For example: The mind having obſerved that *Peter*, *James*, and *John*, reſemble each other in certain common agreements of ſhape and other qualities, leaves out of the complex or compounded idea it has of *Peter*, *James*, and any other particular man, that which is peculiar to each, retaining only what is common to all, and ſo makes an abſtract idea wherein all the particulars equally partake, abſtracting entirely from and cutting off all thoſe circumſtances and differences which might determine it to any particular exiſtence. After this manner, it is ſaid, we come by the abſtract idea of *man*, or, if you pleaſe, humanity or human nature: in which, it is true, there is included colour, becauſe there is no man but has ſome colour; but then it can be neither *black* nor *white*, nor any *particular* colour, becauſe there is no one particular colour wherein all men partake. So likewiſe there is included ſtature; but then it is neithere tall ſtature, nor low ſtature, nor middle ſtature, but ſomething abſtracted from all theſe; and ſo of the reſt. Moreover, there being a great variety of other creatures that partake in ſome parts, but not all, of the complex idea *man*; the mind, leaving out thoſe parts which are peculiar to man, and retaining thoſe only which are common to all the living creatures, frameth the idea of *animal*; which abſtracts not only from all particular men, but alſo from all birds, beaſts, fiſhes, and inſects. The conſtituent parts of the abſtract idea of animal, are body, life, ſenſe, and ſpontaneous motion. By *body*, is meant body without any particular ſhape or figure, there being no one ſhape or figure common to all animals, without covering either of hair or feathers or ſcales, &c. and yet not naked; hair, feathers, ſcales, and nakedneſs, being the diſtinguiſhing properties of particular animals, and for that reaſon left out of the *abſtract idea*. Upon the ſame account, the ſpontaneous motion muſt be neither walking, nor flying, nor creeping: it is nevertheleſs motion; but what that motion is, it is not eaſy to conceive.

85 controverted; and

"Whether others have this wonderful faculty of *abſtracting their ideas* (continues the Biſhop), they beſt can tell; for myſelf, I find indeed that I have a faculty of imagining or repreſenting to myſelf the ideas of thoſe particular things which I have perceived, and of variouſly compounding and dividing them. I can imagine a man with two heads, or the upper parts of a man joined to the body of a horſe. I can conſider the hand, the eye, the noſe, each by itſelf abſtracted or ſeparated from the reſt of the body. But then, whatever hand or eye I imagine, it muſt have ſome particular ſhape, and ſome particular colour. Likewiſe the idea of man that I frame to myſelf, muſt be either of a white, or a black, or a tawney, a ſtraight or a crooked, a tall or a low, or a middle-ſized man. I cannot by any effort of thought conceive the abſtract idea above deſcribed. To be plain, I own myſelf able to abſtract in one ſenſe, as when I conſider ſome particular parts or qualities ſeparated from others with which, though they are united in ſome objects, yet it is poſſible they may really exiſt without them. But I deny that I can abſtract one from another, or conceive ſeparately thoſe qualities which it is impoſſible ſhould exiſt ſo ſeparated; or that I can frame a general notion by abſtracting from particulars in the manner aforeſaid; and there are grounds to think moſt men will acknowledge themſelves to be in my caſe."

86 ſhewn to be abſurd,

To think this there are indeed ſuch good grounds, that it is probable ſome of our readers, little converſant with the writings of modern metaphyſicians, are by this time diſpoſed to ſuſpect, that the Biſhop in his zeal may have miſrepreſented the doctrine of *abſtraction*; as no man in his ſenſes who is not perverted by ſome darling hypotheſis, can ſuppoſe himſelf capable of tagging together ſuch monſtrous inconſiſtencies, as magnitude which is neither large nor ſmall, and colour which is neither white, red, green, nor black, &c. But that the ingenious prelate, in his account of this proceſs of *lopping* and *pruning*, as Mr Harris contemptuouſly, but moſt properly, terms it, has not exaggerated in the ſmalleſt degree, is apparent from the following account of *abſtraction* given by Mr Locke. "*Abſtract ideas* (ſays that writer) are not ſo obvious or eaſy to children, or the yet unexerciſed mind, as particular ones. If they ſeem ſo to grown men, it is only becauſe by conſtant and familiar uſe they are made ſo: for when we nicely reflect upon them, we ſhall find that general ideas are fictions and contrivances of the mind that carry difficulty with them, and do not ſo eaſily offer themſelves as we are apt to imagine. For example, Does it not require ſome pains and ſkill to form the general idea of a triangle (which is yet none of the moſt abſtract comprehenſive and difficult)? for it muſt be neither oblique nor rectangle, neither equilateral, equicrural, nor ſcalenon, but *all and none of theſe at once*. In effect, it is ſome thing imperfect that cannot exiſt, an idea wherein ſome parts of ſeveral different and *inconſiſtent* ideas are put together." "Surely (to uſe the words of principal Campbell[*]) the bare *mention* of this hypotheſis is equivalent to a confutation of it, ſince it really confutes itſelf." But if any man has the faculty of framing in his mind ſuch an idea of a triangle as is here deſcribed, it would be vain in us to diſpute with him; for we are poſſeſſed of no ſuch faculty, and therefore would fight on unequal terms. All we have to deſire is, that the reader would fully and certainly inform himſelf whether he has ſuch an idea or not; and this can be no hard taſk to perform. What is more eaſy for any one than to look a little into his own thoughts, and there try whether he has, or can attain to have, an idea of *colour*, ſeparated from all *extenſion*; of *extenſion*, which is neither *great* nor *ſmall*; of *taſte*, which is neither *ſweet* nor *bitter*, nor

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[*] Philoſophy of Rhetoric.

acid, nor *agreeable*, nor *diſagreeable*; or the general idea of a triangle, which is neither *oblique* nor *rectangle*, *equicrural*, *equilateral*, nor *ſcalenon*, *but all and none of theſe at once* (I)?

87 Abſtract conceptions the ſame with abſtract ideas.

Dr Reid having denied that there are or can be in the mind any *ideas* of ſenſible objects, rejects of courſe the doctrine of *abſtract general ideas*, whilſt he maintains in fact the ſame thing, only ſubſtituting the word *conception* for the word *idea*. "What hinders me (ſays he) from attennidg to the whiteneſs of the paper before me, without applying that colour to any other object?" We know nothing indeed which can hinder any man from performing this operation, which is daily and hourly performed by infants; but will the Doctor ſay, that he can attend to colour, or conceive it, abſtracted from the paper and every other ſurface? We are perſuaded he will not, though he immediately adds, "the whiteneſs of this individual object is an *abſtract conception*." Now we ſhould rather have thought, that, conſiſtent with his own notions of colour, he would have called the whiteneſs of the paper a *concrete quality*, and his own conception of it a *particular* and *concrete conception*. If he conceives the whiteneſs as ſeparated from the paper, it is no longer the whiteneſs of that individual object: and he muſt either conceive it as abſtracted from *all* objects, which is plainly impoſſible: or he muſt conceive it as inhering in ſome other object; and then neither the quality of whiteneſs, nor his conception of it, is abſtract and general, but concrete and particular. He affirms, however, "that in abſtraction, ſtrictly ſo called, he can perceive nothing that is difficult either to be underſtood or practiſed." This is going much farther into the doctrine than Mr Locke went: for he owned that there was much difficulty in it. Let us ſee how it becomes ſo eaſy to Dr Reid. "What can be more eaſy (ſays he) than to diſtinguiſh the different attributes which we know to belong to a ſubject? In a man, for inſtance, to diſtinguiſh his ſize, his complexion, his age, his fortune, his birth, his profeſſion, and twenty other things that belong to him." All this indeed, and much more, we can do with the utmoſt eaſe; but this is not abſtraction, ſtrictly ſo called, nor any thing like abſtraction. We diſtinguiſh the ſize, the complexion, the age, &c. of the man, from *one another*: but ſtill we conceive them all as *his* qualities; nor is it poſſible, at leaſt for us, *to abſtract them from him*, without conceiving them as the qualities of ſome *other* man; ſo that *our* conceptions are all concrete and particular. "It ought likewiſe to be obſerved (ſays the Profeſſor), that attributes may with perfect eaſe be diſtinguiſhed and *disjoined* in our conception, which cannot be *actually ſeparated* in the ſubject." They may be ſo in his conception, but certainly not in ours; for *we* can conceive nothing which may not actually exiſt. "Thus (continues he) I can in a body diſtinguiſh its ſolidity from its extenſion, and its weight from both. In extenſion, I can diſtinguiſh, length, breadth, and thickneſs yet none of theſe can be ſeparated from the body, or from one another. It is therefore *certain*, that attributes, which in their nature are abſolutely inſeparable from their ſubject and from one another, may be disjoined in our conception; one *cannot exiſt* without the other, but one *can be conceived* without the other." So far is this from being a matter of *certainty*, that in every poſſible ſenſe in which we can underſtand the word *conception*, it appears to us as evidently *falſe*, as that *three* and *two* are equal to *nine*. It is indeed not difficult to diſtinguiſh *in* a body its ſolidity from its extenſion, and its weight from both: but can we diſtinguiſh them *out* of the body? or, to ſpeak in plain language, can we conceive *ſolidity* as ſeparated from *all extenſion* and *all weight?* Unleſs this can be done, and by *us* it cannot be done, there is no *abſtraction ſtrictly ſo called*. It is indeed eaſy to conceive *ſolidity* or *extenſion* abſtracted from *any one* individual object: but how is it done? Why, by transferring your attention to ſome other *individual object*. Thus, we can eaſily conceive *ſolidity* or *extenſion* ſeparated from a guinea, for inſtance; but it is only by transferring our thoughts to another body, *a piece of ſilver*, or a *ball of lead*, &c. and our conceptions in both caſes are *particular* and *concrete*.

As we think the opinion of Dr Reid's reſpecting ABSTRACTION both ill-founded and of dangerous conſequences, we have expreſſed our diſſent from it in ſtrong terms; and in doing ſo we have only followed the example ſet us by himſelf when diſſenting from the theories of Hume and Berkely. But we are ſo thoroughly convinced that the Doctor's acuteneſs is ſuperior to our own (L), that we are not without our fears that we may have miſtaken his meaning. We are conſcious that we have not wilfully miſrepreſented it; and to enable our readers to judge for themſelves between him and us, we ſhall lay before them his definition of *general conceptions* in his own words.

88 Terms, how they are

That there are in every language *general terms*, is known to all mankind: for ſuch are all ſubſtantives, proper names excepted; and all adjectives. But "it is impoſſible (ſays the Doctor*) that words can have a general ſignification, unleſs there be conceptions in the

* Eſſay on the Intellectual Powers of Man.

(I) "If ſuch an extraordinary faculty (abſtraction) were poſſible, I cannot for my part conceive what purpoſe it could ſerve. An idea hath been defined by ſome logicians, the form or reſemblance of a thing in the mind; and the whole of its power and uſe in thinking is ſuppoſed to ariſe from an exact conformity to its archetype. What then is the uſe or power of that idea, to which there neither is nor can be any archetype in nature, which is merely a creature of the brain, a monſter that bears not the likeneſs of any thing in the univerſe!"——*Philoſophy of Rhetoric*, vol. ii. p. 110.

(L) Notwithſtanding this declaration, which is made with the greateſt ſincerity, we do not apprehend that we are guilty of preſumption when we examine the Doctor's opinions. Berkley and Hume were certainly as acute as any metaphyſician who has ſucceeded them; yet their opinions have been canvaſſed without ceremony, and to much advantage. *Aliquando bonus dormitat Homerus.*

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the mind of the ſpeaker and of the hearer, of *things* (M) that are *general*. It is to ſuch that I give the name of *general conceptions*: and it ought to be obſerved, that they take this denomination, not from the act of the mind in conceiving, which is an individual act; but from the object or thing conceived, which is general." Now, whatever is conceived, muſt be either *external* to the mind, or *preſent* with it. But the Doctor himſelf acknowledges, "That all the objects we perceive are individuals. Every object of ſenſe, of memory, or of *conſciouſneſs*, is an individual object. All the good things we enjoy or deſire, and all the evils we feel or fear, muſt come from individuals; and I think we may venture to ſay, that every creature which God has made in the heavens above, or in the earth beneath, or in the waters under the earth, is an individual." If this be ſo, and no man can call it in queſtion, it is obvious that we can have no *general* conception of any thing *external*. The *act* of conceiving is *an individual act*; and therefore the only thing which can be *general*, muſt be ſomething preſent with the mind, and different from the *mere act of conceiving*: But what can this be, if not what Berkeley and others call an *idea*? and how can we have an *idea* of which we are not *conſcious*? yet every thing of which we are conſcious Dr Reid himſelf acknowledges to be an *individual*.

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Of general ſignification.

But if the Doctrine generally received reſpecting abſtract ideas be ſo very abſurd as it has appeared in our repreſentation, how comes it to be ſo prevalent among the acuteſt philoſophers? To this we anſwer, that thoſe philoſophers have certainly in this inſtance been impoſed upon by the ſtructure of language. Every adjective and every ſubſtantive, proper names excepted, are words of general ſignification; and all ſcience is converſant about general truth: but as words are ſaid to be ſignificant, not of things, but of ideas; and as truth reſults from the agreement or coincidence of ideas; it has been haſtily ſuppoſed, that without general ideas there could have been neither general terms nor general truth. This is plauſible, but it is not ſolid. Every object which affects our ſenſes is an individual object; but we perceive that two or more objects which affect ſome of our ſenſes very differently, affect others of them in preciſely the ſame way. Thus, the paper upon which one writes, the ſnow which he perceives from his window, and the milk which he may uſe at breakfaſt, affect his ſenſes of touch and taſte very differently, but they preſent the ſame appearance to his eye. This diverſity in the one caſe he believes to proceed from different powers or qualities in the ſeveral objects; and the ſameneſs of appearance in the other, from ſimilar qualities in theſe objects. To the ſimilar qualities, though he can frame no idea of them abſtracted from every individual object, he gives one common name; and calls every object which preſents the ſame appearance to his eye that ſnow does, a *white* object; where the word *white* does not ſtand for an abſtract idea, but for a quality inherent in one or more objects. Hence the origin of adjectives in language, which denote more than can be expreſſed by any claſs of ſubſtantives; for every adjective, beſides the power of a name, includes in itſelf the force of a conjunction. See GRAMMAR.

The other claſs of general terms comprehends ſubſtantives: of which the origin is as follows. The objects about which we have occaſion to ſpeak or write are ſo numerous and ſo fluctuating, that if every individual had a proper name, a complete language could never be formed. But as there are not perhaps in nature two objects that appear to us ſimilar in all reſpects, ſo are there not in nature two objects which affect *all* our ſenſes differently. The mind, therefore, either actually perceiving two or more objects at once, or contemplating the *ideas* left by two or more objects in the memory, perceives, by its intellective power, in what reſpects they agree and in what they diſagree. If the agreement be ſtriking, and in more qualities than one, it combines the ſeveral individuals into one claſs or ſpecies, giving to the whole a common name, which equally denotes the ſpecies and every individual belonging to it. Thus, obſerving that Peter, James, and John, agree in having the ſame erect form, in walking on two legs, in having hands, &c. and in being endowed with reaſon, we combine theſe three, and all other individuals which we perceive to agree in the ſame ſtriking and important qualities, into one ſpecies, to which we give the name of *man*—a word which equally denotes the whole ſpecies and every individual of it. Again, contemplating ſeveral figures, which all agree in the circumſtance of being bounded by three ſtraight lines meeting one another ſo as to form three angles, we call the whole claſs of figures and each individual by the name of *triangle*—though it may be impoſſible to contemplate any number of triangles without perceiving that all the angles of one are acute; that one angle of another is a right angle; and that in the third there is one angle obtuſe: but the word *triangle*, unleſs it is limited in its ſignification by the addition of an adjective, is equally expreſſive of an acute-angled triangle, a right-angled triangle, and an obtuſe-angled triangle. By thus arranging individuals according to their moſt conſpicuous qualities, we may combine all the objects exiſting into ſo many claſſes or ſpecies, which ſhall be afterwards known by as many names; but of each ſpecies we neither have, nor can have, any other idea than that of a multitude of ſimilar individuals.

As our acquaintance with nature enlarges, we diſcover reſemblances ſtriking and important between one ſpecies and another, which naturally begets the notion of a higher claſs called a *genus*. From comparing man with beaſts, birds, fiſhes, and reptiles, we perceive that they are all alike poſſeſſed of life, or a principle of ſenſation and action, and of an organiſed body: hence we rank them all under a higher claſs or genus, to which we give the name of *animal*; which equally denotes the whole *genus*, each *ſpecies* comprehended under the *genus*, and every *individual* of every *ſpecies*. Thus, *animal* is a *genus*; *man*, *beaſt*, *bird*, are ſo many *ſpecies* comprehended under that *genus*; and *Peter*, *James*, and *John*, are *individuals* of the ſpecies *man*. *Peter*, *James*, and *John*, are proper names, denoting each an *individual*;

(M) He tells us ſoon afterwards, that there are *no things general*. How is the one paſſage to be reconciled with the other?

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dual; man, beaſt, bird, are *ſpecific* terms, denoting each a *whole ſpecies* compriſing many *individuals*; and *animal* is a *general term*, becauſe it denotes a *whole genus*, comprehending under it *ſeveral ſpecies*, of which each conſiſts of *many individuals*; and the general term denotes either the whole *genus*, all the *ſpecies*, or any *individual* of all the ſpecies. This is the whole myſtery of *abſtraction*: they are merely *terms*, that in ſtrictneſs of ſpeech are *general* and *abſtract*; and even theſe are general only as *ſigns*, of which the full ſignification cannot always be repreſented by any conceivable *idea*.

90 Names and ideas often uſed as mere ſigns.

"It is a received opinion (ſays Biſhop Berkeley), that language has no other end but the communicating of our ideas, and that every ſignificant name ſtands for an idea. This being ſo; and it being withal certain, that names, which yet are not thought altogether inſignificant, do not always mark out particular conceivable ideas; it is ſtraightway concluded that they ſtand for abſtract notions. That there are many names in uſe amongſt ſpeculative men, which do not always ſuggeſt to others determinate particular ideas, is what nobody will deny: and a little attention will diſcover, that it is not neceſſary, even in the ſtricteſt reaſonings, that ſignificant names, which ſtand for ideas, ſhould every time they are uſed excite in the underſtanding the ideas they are made to ſtand for. In reading and diſcourſing, names are for the moſt part uſed as letters in algebra; in which, though a particular quantity be marked by each letter, yet to proceed right, it is not requiſite that in every ſtep each letter ſuggeſt to our thoughts that particular quantity it was appointed to ſtand for. The ſame thing is true of ideas, which as well as names are often uſed merely as ſigns repreſenting a whole claſs; and on that account they may be called *general*, though every idea is in itſelf ſtrictly particular. Thus, "An idea, which conſidered in itſelf is particular, becomes general by being made to repreſent or ſtand for all other particular ideas of the ſame ſort. To make this plain by an example, ſuppoſe a geometrician is demonſtrating the method of cutting a line in two equal parts: He draws, for inſtance, a black line of an inch in length: this, which in itſelf is a particular line, is nevertheleſs with regard to its ſignification, general; ſince, as it is there uſed, it repreſents all particular lines whatſoever: ſo that what is demonſtrated of it is demonſtrated of all lines, or, in other words, of a line in general. And as that particular line becomes general by being made a ſign; ſo the *name* line, and the *idea* of a line in the imagination, either of which taken abſolutely is particular, by being ſigns are made general likewiſe. And as the former owes its generality, not to its being the ſign of an abſtract or general line, but of all particular right lines that may poſſibly exiſt; ſo the latter, the name and the idea, muſt be thought to derive their generality from the ſame cauſe, namely, the various particular lines which each of them indifferently denotes." Again, when one demonſtrates any propoſition concerning triangles, it is to be ſuppoſed that he has in view to demonſtrate an univerſal truth; yet the particular triangle which he conſiders muſt be either equilateral, iſoſceles, or ſcalenon; for a plain triangle, which is none of theſe, can neither exiſt nor be conceived. But whether it be of this or that ſort is of no importance, as any of them may equally ſtand for and repreſent all rectilineal triangles, and on that account be denominated *univerſal*.

This doctrine reſpecting names and ideas being uſed merely as *ſigns*, has been adopted by almoſt every ſubſequent philoſopher; and by Principal Campbell it has been illuſtrated with perſpicuity and acuteneſs every way worthy of the author of the Diſſertation on Miracles. "In confirmation of this doctrine (ſays he *), it may be obſerved, that we really think by *ſigns*, as well as ſpeak by them. All the truths which conſtitute ſcience, which give exerciſe to reaſon, and are diſcovered by philoſophy are general; all our ideas, in the ſtricteſt ſenſe of the word, are particular. All the particular truths about which we are converſant are properly hiſtorical, and compoſe the furniture of memory. Nor do I include under the term *hiſtorical* the truths which belong to natural hiſtory; for even theſe too are general. Now, beyond particular truth or hiſtorical facts, firſt perceived and then remembered, we ſhould never be able to proceed one ſingle ſtep in thinking any more than in converſing without the uſe of ſigns.

"When it is affirmed that *the whole is equal to all its parts*, there cannot be an affirmation which is more perfectly intelligible, or which commands a fuller aſſent. If, in order to comprehend this, I recur to ideas, all that I can do is to form a notion of ſome individual whole, divided into a certain number of parts of which it is conſtituted; ſuppoſe of the year, divided into the four ſeaſons. Now all that I can be ſaid to diſcern here is the relation of equality between this particular whole and its component parts. If I recur to another example, I only perceive another particular truth. The ſame holds of a third and of a fourth. But ſo far am I, after the perception of ten thouſand particular ſimilar inſtances, from the diſcovery of the univerſal truth, that if the mind had not the power of conſidering things as ſigns, or particular ideas as repreſenting an infinity of others, reſembling in one circumſtance though totally diſſimilar in every other. I could not ſo much as conceive the meaning of an univerſal truth. Hence it is that *ſome ideas*, to adopt the expreſſion of Berkeley, *are particular in their nature, but general in their repreſentation*."

91 Which, though particular in themſelves, ſerve to demonſtrate general truths; becauſe

But if in univerſal propoſitions, ideas particular in themſelves be uſed only as the ſigns of others, it may be demanded, how we can know any propoſition to be true of all the ideas which are repreſented by the ſign? For example, having demonſtrated that the three angles of an iſoſceles rectangular triangle are equal to two right ones, how can we conclude that this affection therefore agrees to all other triangles which have neither a right angle nor two equal ſides? To this queſtion Biſhop Berkeley and Principal Campbell give the following anſwer: Though the idea we have in view whilſt we make the demonſtration be that of an iſoſceles rectangular triangle, whoſe ſides are of a determinate length, we may yet be certain that the demonſtration extends to all other rectilineal triangles of what ſort or bigneſs ſoever; for this plain reaſon, that neither the equality nor determinate length of the ſides, nor the right angle, are at all concerned in the demonſtration. It is true, the idea or diagram we have in view includes all theſe particulars; but then there is not the leaſt mention made of them in the proof

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* Philoſophy of Rhetoric.

Of Abſtraction and general Ideas.

proof of the propoſition. It is not ſaid the three angles are equal to two right angles, *becauſe* one of them is a *right angle*, or becauſe the ſides comprehending it are of equal length; which ſufficiently ſhows that the right angle might have been oblique and the ſides unequal; and for all that the demonſtration have held good. In every one of Euclid's theorems, a particular triangle, and a particular parallelogram and a particular circle, are employed as ſigns to denote all triangles, all parallelograms, and all circles. When a geometrician makes a diagram with chalk upon a board, and from it demonſtrates the property of a ſtraight-lined figure, no ſpectator ever imagines that he is demonſtrating a property of nothing elſe but that individual white figure, five inches long, which is before him.—Every one is ſatisfied that he is demonſtrating a property of all of that order, whether more or leſs extenſive, of which it is both an example and a ſign; all the order being underſtood to agree with it in certain characters, however different in other reſpects. Nay, what is more, the mind, with the utmoſt facility extends or contracts the repreſentative power of the ſign as the particular occaſion requires. Thus the ſame equilateral triangle will with equal propriety ſerve for the demonſtration, not only of a property of all equilateral triangles, but of a property of all iſoſceles triangles, or even of a property of all triangles whatever. Nay, ſo perfectly is this matter underſtood, that if the demonſtrator in any part ſhould recur to ſome property belonging to the particular figure he hath conſtructed, but not eſſential to the kind mentioned in the propoſition, and which the particular figure is ſolely intended to repreſent, every intelligent obſerver would inſtantly detect the fallacy: So entirely for all the purpoſes of ſcience doth a particular ſerve for a whole ſpecies or genus. Now, why one *viſible* individual ſhould in our reaſonings ſerve without the ſmalleſt inconvenience as a ſign for an infinite number, and yet one *conceivable* individual, or a particular idea of imagination, ſhould not be adapted to anſwer the ſame end, it will, we imagine, be utterly impoſſible to ſay (N).

It muſt, however, be confeſſed, that there is a conſiderable difference in kind, between *ideas* uſed as ſigns and the *general* terms of any language. Amongſt all the individuals of a ſpecies, or even of the higheſt genus, there is ſtill a natural connection, as they agree in the ſpecific or generic character; and when the mind makes uſe of any poſitive idea as the ſign of the ſpecies or genus, that idea appears in the imagination as an exact reſemblance of ſome one individual. But the connection which ſubſiſts between words and things, or even between words and ideas, is in its origin arbitrary; and yet its effect upon the mind is much the ſame with that of the natural connection between ideas and things. For having often had occaſion to obſerve particular words uſed as ſigns of particular things, and ſpecific terms uſed as ſigns of a whole ſpecies, we contract a habit of aſſociating the ſign with the thing ſignified, inſomuch that either being preſented to the mind neceſſarily introduces or occaſions the apprehenſion of the other. Cuſtom in this inſtance operates preciſely in the ſame manner as natural reſemblance in the other; ſo that certain ſounds, and the ideas of things to which they are not naturally related, come to be as thoroughly linked in our conceptions as the ideas of things and the things themſelves. Nay, ſo completely are they linked together, that we often uſe, through long chains of reaſoning, certain ſounds or words, without attending at all to the ideas or notions of which they are ſigns. "I believe (ſays the author of *A Treatiſe on Human Nature*), that every one who examines the ſituation of his mind in reaſoning will agree with me, that we do not annex diſtinct and complete ideas to every term we make uſe of; and that in talking of *government, church, negotiation, conqueſt*, we seldom ſpread out in our minds all the ſimple ideas of which the compound notions ſignified by theſe terms are compoſed. It is, however, obſervable, that notwithſtanding this imperfection, we may avoid talking nonſenſe on theſe ſubjects, and may perceive any repugnance among the ideas, as well as if we had a full comprehenſion of them." This remark generally holds true; but then it is to be obſerved, that all the words uſed as ſigns, and which yet do not denote any one conceivable determinate *idea*, muſt be capable of definition. Thus, in matters that are perfectly familiar, in ſimple narration, or in moral obſervations on the occurrences of life, a man of common underſtanding may be deceived by ſpecious falſehood, but is hardly to be gulled by downright nonſenſe or a repugnance of ideas. Almoſt all the poſſible applications of the terms (in other words, all the acquired relations of the ſigns) have become cuſtomary to him. The conſequence is, that an unuſual application of any of them is inſtantly detected; this detection breeds doubt, and this doubt occaſions an immediate recourſe to *definition*; which, proceeding through ſpecies and genera, reſolves complex terms into others leſs complex, till it ends at laſt in ſimple ideas and relations, which can neither be defined nor miſunderſtood (O). See Logic.

(N) Were it poſſible to frame an *abſtract general idea* of a triangle, which is neither equilateral, iſoſceles, nor ſcalenon, even *that idea* muſt be uſed merely as a ſign as much as any particular triangle whatever: and the queſtion might ſtill be aſked, How we can know any propoſition to be true of all the triangles repreſented by the ſign? For example: having demonſtrated that the three angles of an ideal triangle, which is neither equilateral, iſoſceles, nor ſcalenon, are equal to two right angles, how can we conclude that this affection agrees to triangles which are equilateral, &c.? To this queſtion it is not eaſy to conceive what anſwer could be given other than that of Berkeley and Campbell, in the caſe of uſing particular and conceivable triangles as ſigns.

(O) Since this article was written, ſome excellent obſervations on the common doctrine concerning abſtraction have been given to the public by profeſſor Dugald Stewart of Edinburgh. See *Elements of the Philoſophy of the Human Mind.*

Of Abſtraction and general Ideas.

Thus then we ſee, that though there are no ideas, properly ſpeaking, general and abſtract, a man may by *terms* and *particular* ideas, uſed as *ſigns*, arrive at the knowledge of general truth. In neither caſe is it the

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it is not the matter but the power of the ſign that is regarded by the mind.

matter, if we may be allowed the expreſſion, but the *power* of the ſign, that is regarded by the mind. We find, that even in demonſtrative reaſonings, ſigns the moſt arbitrary, or mere ſymbols, may be uſed with as little danger of error as ideas or natural ſigns. The operations both of the algebraiſt and arithmetician are ſtrictly of the nature of demonſtration. The one employs as *ſigns* the letters of the alphabet, the other certain numerical characters. In neither of theſe arts is it neceſſary to form ideas of the quantities and ſums ſignified; in ſome inſtances it is even impoſſible without reſolving the quantity or ſum into parts, in a manner analogous to definition; and then the mind comprehends not the whole quantity or number at once, but the ſeveral parts of which it is compoſed, which it connects (P) by the relation of junction or addition. Yet without this reſolution, the equations and calculations carried on by means of the letters and figures ſignificant of the whole quantity or the whole ſum, are not the leſs accurate or convincing. And ſo much for *abſtraction*, *generalization*, and the power of *ſigns*, whether *natural* or artificial.

CHAP. V. *Of the* ASSOCIATION *of* IDEAS.

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A continued train of thought in the mind.

EVERY man whilſt awake is conſcious of a continued train of thought ſpontaneouſly ariſing in his mind and paſſing through it; nor could a ſingle now or inſtant be pitched upon in which ſome idea is not preſent in his memory or imagination. No one idea, however, unleſs detained by a voluntary exertion of the mind, or unleſs productive of intenſe pleaſure or pain, remains long in the imagination; but each haſtens off the ſtage to make way for another, which takes its turn and is ſucceeded by a third, &c. We are not to imagine that this train of thought is altogether fortuitous and incoherent. "It is evident (ſays Mr Hume*), that there is a principle of connection between different thoughts or ideas of the mind; and that, in their appearance to the memory or imagination, they introduce each other with a certain degree of method and regularity. In our more ſerious thinking or diſcourſe this is ſo obſervable, that any particular thought which breaks in upon the regular tract or chain of ideas, is immediately remarked and rejected. Even in our wildeſt and moſt wandering reveries, nay, in our very dreams, we ſhall find, if we reflect, that the imagination ran not altogether at adventures, but that there was ſtill a connection upheld among the different ideas which ſucceeded each other. Were the looſeſt and freeſt converſation to be tranſcribed, there would immediately be obſerved ſomething which connected it in all its tranſitions: Or, where this is wanting, the perſon who broke the thread of diſcourſe might ſtill inform you, that there had ſecretly revolved in his mind a ſucceſſion of thoughts, which had gradually led him from the ſubject of converſation. Among different languages, even where we cannot ſuſpect the leaſt connection or communication, it is found, that words expreſſive of ideas the moſt compounded, do yet nearly correſpond to each other; a certain proof that the ſimple ideas comprehended in the compound ones, were bound together by ſome univerſal principle, which had an equal influence on all mankind."

* Eſſays.

Aſſociation of ideas.

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Principles of aſſociation.

That theſe obſervations are well founded, every man may be ſatisfied by looking attentively into his own thoughts; but when the author reduces the principles of this aſſociation of ideas to *three*, viz. *reſemblance*, *contiguity* in time and place, and *cauſe* or *effect*, he certainly contracts them within too narrow a compaſs. That theſe principles often ſerve to connect ideas, will not indeed be denied. A picture leads our thoughts to the original: the mention of one apartment in a building introduces an inquiry or diſcourſe concerning the others: and if we think of a wound, we can hardly forbear reflecting on the pain which follows it. But ſurely ideas ſometimes ſucceed each other without *reſemblance*, without *contiguity* in time or in place, and without being connected by the relation of a *cauſe* to its *effect*. Beſides all this, there are other aſſociations than of *ideas*. Ideas are aſſociated with paſſions and emotions, and paſſions and emotions are aſſociated together. A particular idea is aſſociated with a proper name, and often with the general name of the ſpecies. General conceptions, ſuch as thoſe which Mr Locke calls mixed modes (ſee MODE), are aſſociated with ſigns both audible and viſible, and ſigns are aſſociated with each other. Surely virtue, as it conſiſts in action and intention, does not reſemble the *ſound* virtue, is not *contiguous* to it in time or in place, and is neither its *cauſe* nor its *effect*; nor is it conceivable, that the arbitrary ſigns of different things ſhould have any natural relation to one another.

But were the enumeration complete, the bare mention of theſe principles does not account for the phenomena: For, granting the fact, it may ſtill be aſked, Why does a picture lead our thoughts to the original; or the mention of one apartment in a building introduce an inquiry concerning the others? To theſe queſtions our author has given no anſwer; nor are we acquainted with any writer who can be ſaid to have attempted it, except Dr Hartley and his ingenious editor. There may be ſome of our readers whom the names of theſe men will prejudice againſt their theory; but, doubtleſs, the greater part are willing to adopt truth, or to examine an ingenious ſpeculation, from whatever quarter it comes. To ſuch as feel themſelves otherwiſe diſpoſed, we beg leave to ſay, that if they allow the name of *Prieſtley* to diſguſt them at what follows, they will furniſh him with a new proof of the truth of the doctrine which they reject.

That

(P) No man, we think, will pretend that he can perceive at one view a million of individual men, or that he can imagine or conceive at once a million of ideal men: yet he may divide the million into parts, which in the one caſe may be eaſily viewed, and in the other may be eaſily conceived, in ſucceſſion. Thus, 100+100+100, &c.

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How they operate.

That *ideas* ſhould be aſſociated together, ſeems to be inevitable from the manner in which the mind acquires them. All our ideas, properly ſpeaking, are of ſenſible objects, and by far the greater part of them of *viſible* objects. But every ſenſible object conveys at once various ſenſations and perceptions to the mind, which appear not only united in fact, but inſeparable in imagination. Thus, when a man looks at any particular object, a tree for inſtance, he perceives the *trunk*, *branches*, *leaves*, *ſize*, *ſhape*, and *colour*, &c. of the whole at *once*: he does not firſt perceive the *figure* of the trunk, then its *ſize*, then its *colour*, then the *branches*, &c. all in ſucceſſion; but a perception of the *whole* is conveyed to the mind by one ſimultaneous impreſſion (Q). We have already ſeen, that the ſenſes, in fact, convey nothing to the mind but their reſpective ſenſations; and that the perception of the external object inſtantly follows the ſenſation. We have likewiſe ſeen, that ſenſation is occaſioned by ſome impreſſion, concuſſion, or vibration, given to the nerves and brain, and by them communicated to the mind or percipient being. We have likewiſe ſeen, that memory depends as much upon the brain as original ſenſation, and is always attended or occaſioned by ſimilar concuſſions or vibrations, &c. Theſe are facts proved by univerſal experience, and which, we believe, no thinking man has ever called in queſtion. It follows, therefore, that every actual ſenſation muſt leave ſome effect in the brain, either an actual print, which ſeems to be impoſſible, or a tendency to vibrate or be agitated in the ſame way as when the original impreſſion was made. This being the caſe, it is natural to conclude, that when any part of the original perception is revived in the memory, the whole perception ſhould be revived at once, ſo as that we cannot have an idea of the trunk of a tree without perceiving the ideas of the branches aſſociated with it. This is indeed not merely natural, but the contrary ſeems to be impoſſible; for as the original agitation or vibration was occaſioned by the whole tree, it is evident, that whatever effect or tendency that agitation or vibration left behind it, muſt be left by the whole vibration, and therefore be equally related to the whole tree.

But no object ſtands ſingle in nature. When we view a tree, or any thing elſe, we always notice, however tranſiently, the field where it grows and the objects around it. Theſe too leave effects in the brain at the ſame time that the tree does ſo; and therefore make their appearance with it in the memory or imagination: but if the tree was the object to which we principally attended during the actual ſenſation, the idea of it will be much more vivid than the idea of its adjuncts, and remain much longer in the imagination or memory; becauſe the original ſenſation by which it was perceived, was ſtruck much deeper than the ſenſations by which its adjuncts were perceived. All this muſt be intelligible to every one who attends to what we have already ſaid of ſenſation, perception, and memory.

Thus we ſee why a picture leads our thoughts to the original, and why the mention of one apartment in a building introduces an inquiry concerning the others. It is not merely becauſe the picture *reſembles* the original, and becauſe the apartments of a building are *contiguous*. Between a plain ſurface, variouſly coloured and ſhaded, and the contour of the human face, there is certainly very little real reſemblance, as any man may be convinced who places his eye within ſix inches of a good picture. But the painter, having by his ſkill in perſpective, contrived to lay his colours on the plain canvas in ſuch a manner as that they reflect the ſame rays of light with the original, provided the ſpectator ſtand at the proper diſtance; theſe rays proceeding from the picture fall upon the eye in the ſame direction, and therefore give to the nerves and brain the very ſame impulſe which was given by the original. When one apartment of a building is mentioned, we inquire concerning the others from the very ſame cauſe that, when we think of the trunk of a tree which we have ſeen, we cannot avoid thinking likewiſe of its branches.

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Aſſociation gives meaning to the words of language.

But the principle of aſſociation takes place among things not naturally connected, as the apartments of a building and a ſubſtance and its attributes and adjuncts. It is aſſociation which is the original ſource of all the general or complex conceptions which we have, and which even gives meaning to the words of every language. Between ſounds conſidered in themſelves, and things, or the ideas of things, every one knows that there is no natural connection; yet the idea of every known object is in the mind of every man ſo ſtrictly aſſociated with the name that it bears in his native tongue, that the preſence of the one always ſuggeſts the other. It cannot indeed be otherwiſe, if we attend to the manner in which a child learns to affix a meaning to the words which he hears. —A child knows his mother and nurſe, and indeed almoſt every viſible object in the family, long before he acquires the power of articulation. The impreſſions made

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(Q) This is certainly the caſe with adults, but it may be doubted whether it be ſo with very young children. It has been ſhown already, that the ſenſation communicated by the eye from any viſible object, has not the leaſt reſemblance to that object; and that in looking at a tree or any thing elſe, a full grown man pays not the leaſt attention to the appearance which the tree really makes to his eye; nay, that he is not even conſcious of that appearance, farther than as it conſiſts in colour. It is by the ſenſe of touch only that we acquire ideas of figure, even of plain figure; and we imagine that we perceive them by the eye only, becauſe different figures, as diſtinguiſhable by touch, are ſo cloſely aſſociated with their correſponding viſible ſenſations, that long before we are capable of inquiry, theſe two things are inſeparable in the imagination. It is otherwiſe with children, who, when they firſt begin to diſtinguiſh objects by the ſenſe of ſight, appear to do it with great deliberation, as if they firſt felt the proper ſenſation of light and colours ſo or ſo modified, and afterwards acquired, by ſomething like a mental inference, a notion of the figure at which they are looking.

made by theſe objects, and repeated daily and hourly on his brain, every one of which excites a ſenſation, muſt ſoon become ſo deep as not to be eaſily effaced. Numbers of them too are aſſociated together, ſo that the preſence of one introduces the other. It has been already obſerved, that ideas of ſight are the moſt vivid and the moſt laſting; but the child having the ſame ſound often repeated, even that ſound comes in time to leave in his memory a permanent idea. He then hears the ſound *nurſe*, for inſtance, uttered at the time when he is looking earneſtly at the perſon of the nurſe, with whom he is well acquainted, and to whom he is ſtrongly attached; and having the two ideas repeatedly excited together, they ſoon become ſo aſſociated, that the one neceſſarily excites the other: the *word nurſe* calls into view the *idea* of the *woman* treaſured up in his imagination.

But we need not have recourſe to children for the proof of our aſſertion. It is obvious that the name of every ſimple and uncompounded idea can be ſignificant only by aſſociation. Of a complex conception the name may be made intelligible by a definition; but ſimple ideas cannot be defined, and between ideas and ſounds there is no natural connection, ſo as that the one previous to aſſociation ſhould ſuggeſt the other. Even of complex conceptions and mixed modes, the meaning of the names is generally acquired by aſſociation; for though it is certainly true, that all ſuch names are capable of definition, they are yet uſed with ſufficient propriety by thouſands who know not what a definition is. Were a plain unlettered man aſked to define virtue, it is not probable that he could do it ſo as to make himſelf underſtood; yet having ideas of the *practice of juſtice, charity, fortitude*, &c. ſtrictly aſſociated in his mind with the *word virtue*, he may know the general meaning of that word as well as the moſt acute grammarian or the moſt profound philoſopher.

An *alms* is a donation to a poor man; but a child who never heard of this definition knows perfectly what an *alms* is, from having often ſeen his parents give money to a beggar, and call what they were doing by the name *alms*. The ſound of the word, after having ſeen the firſt alms given, will excite in his mind an idea of the *individual* object who received it, and of the *action* of him by whom it was given; but after having ſeen ſeveral poor men relieved, he comes to aſſociate with the word *alms* any thing given to any perſon who needs it or appears to be in want.

So completely does this aſſociation take place between ideas or cluſters of ideas, and the words by which they are expreſſed, that even men of letters hear and underſtand perfectly many words without reviewing in their minds all the ideas and relations of which they are the ſigns. It has been already obſerved, that in talking of *government, church, negotiation, conqueſt*, we ſeldom ſpread out in our minds all the ſimple ideas of which the compound notions ſignified by theſe terms are compoſed; and we now add, that the terms may be uſed with ſufficient propriety, and be perfectly underſtood by thoſe who never attempted to analyſe the notions of which they are ſignificant into their primary and conſtituent parts. Every man has read numberleſs details of the tranſactions of one court with another; he has heard ſuch tranſactions univerſally called by the term *negociation*. The term and the tranſactions ſignified by it are ſo cloſely aſſociated in his mind, that they are in a manner inſeparable; and by this aſſociation he knows the meaning of the term better than he could have done by the moſt complete definition; which, perhaps he would find it difficult to give, or even to comprehend.

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and is the ſource of our firſt notions of virtue.

We have ſaid that the *meaning* of the word *virtue* is acquired by aſſociation, by having often heard that ſound applied to certain *actions*; but it is extremely probable, that the very *notion* of virtue, ſimple and uncompounded as it appears to be, is acquired in the very ſame manner. The *firſt* rudiments of the notions of *right* and *wrong* and *obligation* ſeem to be acquired by a child when he finds himſelf checked and controled by ſuperior power. At firſt he feels nothing but mere *force*, and conſequently has no notion of any kind of reſtraint but that of neceſſity. He finds he cannot have his will, and therefore he ſubmits. Afterwards he attends to many circumſtances which diſtinguiſh the commands of a *father*, or of a *maſter*, from thoſe of any other perſon. Notions of *reverence, love, eſteem*, and *dependence*, are connected with the idea of him who gives thoſe commands; and by degrees the child experiences the peculiar *advantages* of filial ſubjection. He ſees alſo that all his companions, who are noticed and admired by others, obey their parents; and that thoſe who are of a refractory diſpoſition are univerſally diſliked. Theſe and other circumſtances now begin to alter and modify the notion of mere neceſſity, till by degrees he conſiders the commands of a parent as ſomething that *muſt not* be reſiſted or diſputed, even though he has a power of doing it; and all theſe ideas coaleſcing, form the notions of *moral right* and *moral obligation*, which are eaſily transferred from the commands of a parent to thoſe of a magiſtrate, of God, and of conſcience. This opinion of the gradual formation of the ideas of moral right and wrong, from a great variety of elements aſſociated together, perfectly accounts for that prodigious diverſity in the ſentiments of mankind reſpecting the objects of moral obligation; nor do we ſee that any other hypotheſis can account for the facts. If the notion of moral obligation were a ſimple uncompounded idea, ariſing from the view of certain actions or ſentiments; or were it acquired, as it certainly might be, by a chain of reaſoning from the nature of God and the nature of man; why ſhould it not in the one caſe be as invariable as the perception of colours or ſounds, and in the other as our judgements of mathematical or phyſical truths? But though the ſhape and colour of a flower appear the ſame to every human eye; though every man of common underſtanding knows, that if a billiard ball be ſtruck by another, it will move from its place with a velocity proportioned to the force of the impulſe; and though all mankind who have but dipt into mathematics, perceive that any two ſides of a triangle muſt be greater than the third ſide; yet one man practiſes as a moral duty what another looks upon with abhorrence, and reflects on with remorſe. Now a thing that varies with education and inſtruction, as moral ſentiments are known to do, certainly has the appearance of being generated by a ſeries of different impreſſions and aſſociations in ſome ſuch manner as we have endeavoured to deſcribe. Let not any man imagine that this account of the origin of moral ſentiments endangers the cauſe of virtue; for whether thoſe ſentiments be inſtinctive or acquired, their operation is the very ſame, and in either caſe their rectitude muſt often be tried by the teſt of reaſon, ſo that the intereſts of virtue are equally ſafe on this as on any other ſcheme. See *Moral Philoſophy*.

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It ought, therefore, to be attended to in the education of youth.

This principle of aſſociation has ſo great an influence over all our actions, paſſions, reaſonings, and judgments, that there is not perhaps any one thing which deſerves more to be looked after in the education of youth. Some of our ideas—ſuch as thoſe of a ſubſtance and its attributes, a genus and the ſpecies contained under it, a ſpecies and its ſeveral individuals, have a real connection with each other in nature. Theſe it is the office of our reaſon to trace out and to hold together in that union and order in which nature preſents them to the view of the mind; for ſuch aſſociations conſtitute perhaps the greateſt part of neceſſary and of uſeful truths. But there are others formed by cuſtom and caprice, which are too often the ſources of error, ſuperſtition, vice, and miſery—of errors the more dangerous, and of vice the more deplorable; that if the aſſociations have been long formed without an attempt to diſſolve them, they generally become at laſt too ſtrong to be broken by the moſt vigorous effort of the beſt diſpoſed mind. Thus, let a fooliſh maid * amuſe or rather frighten children with ſtories of ghoſts appearing in the dark, let her repeat theſe fictions till they have made a deep impreſſion on the young minds, and the notion of ghoſts will in time become ſo cloſely aſſociated with the idea of darkneſs, that the one ſhall always introduce the other; and it may not be in the power of the children, after they have become men, and are convinced in their judgments of the falſehood and abſurdity of the tales which originally frightened them, to ſeparate entirely the notion of ghoſts from the idea of darkneſs, or with perfect eaſe to remain alone in a dark room. Again, let the idea of *infallibility* be annexed to any perſon or ſociety, and let theſe two inſeparably united conſtantly poſſeſs the mind; and then one body in ten thouſand places at once ſhall, unexamined, be ſwallowed for an incontrovertible fact, whenever that infallible perſon or ſociety dictates or demands aſſent without enquiry.

Some ſuch wrong and unnatural combinations of ideas will be found to eſtabliſh the irreconcileable oppoſition that we find between different ſects in philoſophy and religion; for we cannot imagine every individual of any ſect to impoſe wilfully on himſelf, and knowingly to reject truth offered by plain reaſon. That which leads men of ſincerity and good ſenſe blindfold, will be found, when inquired into, to be ſome early and wrong aſſociation. Ideas independent and of no alliance to one another, are by education, cuſtom, and the conſtant din of their party, ſo linked together in their minds, that they can no more be ſeparated from each other than if they were but one idea; and they operate upon the judgment as if they really were but one. This gives ſenſe to jargon, the force of demonſtration to abſurdities, and conſiſtency to nonſenſe: it is the foundation of the greateſt and moſt dangerous errors in the world; for as far as it obtains, it hinders men from ſeeing and examining.

Before we diſmiſs the ſubject of aſſociation, it may be proper to enquire, how far it is agreeable to the account which we have given of the manner in which external objects are perceived by means of the ſenſes, and the ideas of ſuch objects retained in the memory.—It has been proved, we think, by arguments unanſwerable, that by the organs of ſenſe nothing is conveyed immediately to the mind but ſenſations which can have no reſemblance to external objects, and that the perception of an object may be reſolved into a proceſs of reaſoning from effects to cauſes.—But children it will be ſaid, do not reaſon from effects to cauſes, and yet they ſoon acquire the faculty of perceiving and diſtinguiſhing the objects with which they are ſurrounded. This is an undoubted truth, and it can be accounted for only by the principle of aſſociation. A child has as much the uſe of his ſenſes as a full grown man. By his eye he has the ſenſation of colour; by his noſe, that of ſmell; by his ear he has the ſenſation of ſound; and by his hand he feels heat and cold, reſiſtance and bounded reſiſtance. Every object which is preſented to him, impreſſes his mind with various ſenſations: and theſe ſenſations combined together are probably all that he perceives for ſome years; for there is no reaſon to imagine that a boy of one or two years old has the ſlighteſt notion of what we mean by ſolidity, hardneſs, ſoftneſs, or indeed of that which is termed *ſubſtance*. Yet when two or more objects are preſent, he may eaſily diſtinguiſh the one from the other, becauſe the ſenſations excited by the one muſt differ from thoſe excited by the other, as much as the real qualities of the one are different from the real qualities of the other; and by diſtinguiſhing between his own ſenſations, he in effect diſtinguiſhes between the objects which produce theſe ſenſations. His ſenſations too being frequently excited, leave behind them ideas in his memory or imagination; and thoſe ideas, from having been imprinted together and never ſeparated, become in time ſo cloſely aſſociated, that whenever one of them is called into view, the others neceſſarily make their appearance with it. Thus a child has a ſet of combined ſenſations excited in his mind by the preſence of his nurſe; he has a different cluſter excited, ſuppoſe, by the preſence of his mother. Theſe are often repeated, and leave deep traces behind them; ſo that when the mother or the nurſe makes her appearance, ſhe is immediately recogniſed as a known object; or, to ſpeak more correctly, the child feels the very ſame ſenſations which he has felt before, from which he has experienced pleaſure, and of which he has the ideas treaſured up in his memory or imagination. A ſtranger, on the other hand, muſt affect him with a ſet of new ſenſations, and of courſe will be diſtinguiſhed from a known object as accurately as if the child were poſſeſſed of the notions of ſolidity, ſubſtance, qualities, and diſtance. A man born blind, who knew not that ſuch things as fire and ſnow had ever exiſted, would yet diſtinguiſh the one from the other the moment that he ſhould be brought within their influence. He could not indeed apply their names properly, nor ſay which is the fire and which the ſnow, nor would he at firſt have any notion of either of them as a real, external, and diſtant object; but he would certainly diſtinguiſh his own ſenſations, the ſenſation of heat from that of cold. It is juſt ſo with a child: At firſt he perceives nothing but different ſenſations. Theſe he can

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The principle of aſſociation operates in our perception of external objects;

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* Locke's Eſſay, and his Conduct of the Underſtanding.

can diſtinguiſh; and as they are cauſed by different objects, in diſtinguiſhing between the ſenſations he will appear to diſtinguiſh between the objects themſelves. In a ſhort time, however, he acquires, by the following proceſs, ſome inaccurate notions of diſtance. He looks, for inſtance, earneſtly in his nurſe's face, and at the ſame time touches her cheek perhaps by accident. He repeats this operation frequently, till the ſenſation communicated by his eye comes to be aſſociated with that of his touch, and with the extending of his arm; and being all treaſured up as aſſociated ideas in the memory, the ſight of his nurſe makes him ever afterwards ſtretch out his hands with a deſire to touch her. All this while there is not the ſlighteſt probability that the child has any notion of *ſubſtance* or *qualities*, or of any thing beyond his own *ſenſations*, and the means by which he has experienced, that ſenſations which are pleaſant may be obtained, and that ſuch as are painful may be avoided. The preciſe time at which a child begins to think of external things we cannot pretend to aſcertain; but we are perſuaded that it is later than many perſons imagine, and certainly not till he has made conſiderable progreſs in the exerciſe of reaſon. Prior to that period the things which men know to be bodies, are known to children only as ſenſations and ideas ſtrongly bound together by the tie of aſſociation.

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But if aſſociation be of ſuch importance in the act of ſenſation, it is of ſtill greater in that of retention; for it ſeems to conſtitute the whole difference that there is between imagination and memory. By many of the ancients, as well as by ſome modern philoſophers, theſe two faculties ſeem to have been confounded with each other; but between them there is certainly a great difference, though they likewiſe reſemble each other in ſome reſpects. An idea of memory, conſidered by itſelf, makes the very ſame appearance to the intellect as an idea of imagination. We contemplate both as if they were actual, though faint and diſtant perceptions: but the one is attended with the conviction, that it is the idea of an object which has really been perceived at ſome period of paſt time; whilſt the other is attended with no conviction, except that the idea itſelf is actually preſent to the mind. Mr Hume has ſaid, that ideas of memory differ from thoſe of imagination only in being more vivid and diſtinct; but certainly this is not always the caſe. An idea of imagination has ſometimes been taken for a real perception, which an idea of memory can never be. The difference between thoſe two kinds of ideas, we are perſuaded, ariſes chiefly, if not wholly, from aſſociation. Every idea of memory is aſſociated with many others, and thoſe again with others down to the very moment of the energy of remembrance; whereas ideas of imagination are either the voluntary creatures of the fancy at the moment of their appearance, in which caſe we ſhould call them conceptions; or they are ideas which we have actually received from ſenſation, but which, on account of ſome link being broken in the vaſt chain of aſſociation, we cannot refer to any real objects. What gives probability to this conjecture is, that ideas often appear in the mind which we know not whether to refer to the memory or imagination, nothing being more common than to hear a perſon ſay, I have in my head the idea of ſuch or ſuch an object; but whether I remember or only imagine the object, I am very uncertain. Afterwards, however, by turning the idea over and over in the mind, he finds other ideas make their appearance, till at laſt cluſters of them come into view, and aſſociate ſo cloſely with the principal idea, which was the object of doubt, as to convince the judgment that it is an idea of memory.

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It has been aſked, Why we believe what we diſtinctly remember? and to that queſtion it has been ſuppoſed that no anſwer can be given. But it appears to us, that aſſociation is the ground of belief in this as it will be found to be in other inſtances; and that a man believes he waſhed his hands and face in the morning, becauſe the idea of that operation is ſo ſtrongly linked in his mind to the whole train of ideas which have ariſen, in it through the day, that he cannot ſeparate the firſt from the laſt, that which was a ſenſation in the morning from the ſenſations which are preſent at the inſtant of remembrance. As thoſe ideas are aſſociated by nature, each muſt paſs in review in its proper order; ſo that in ſo ſhort a ſpace of time there is no danger, and hardly a poſſibility, of taking the firſt for the laſt, or the laſt for the firſt. Nay more, we will venture to hazard an opinion, that every paſt event of a man's life, which he diſtinctly remembers, is tied by the chain of aſſociation to his preſent perceptions. That this is poſſible is certain, ſince it is not difficult to conceive how it may be done. The principal events of a ſingle day may ſurely be ſo linked together as to be all diſtinctly reviewed in a cluſter of ideas on the morrow. Of theſe events ſome one or other muſt be the moſt important, which will therefore make its appearance as an idea more frequently than the reſt, and be more cloſely aſſociated with the events of next day. Some event of that day will, for the ſame reaſon, be more cloſely aſſociated with it than the others; and theſe two, dropping perhaps all the reſt of their original companions, will paſs on together to the third day, and ſo on through weeks and months and years. In the compaſs of a year, ſeveral things muſt occur to make deep impreſſions on the mind. Theſe will at firſt be aſſociated together by events of little importance, like the occurrences of a ſingle day. Whilſt theſe feeble chains, however, continue unbroken, they will be ſufficient to link the one important event to the other, and to bring them both into view at the ſame time, till at laſt theſe two, from appearing ſo often together, will in time unite of themſelves, and the intermediate ideas be completely effaced. Thus may two or three important events of one year be aſſociated with ſuch a number of ſimilar events of another year, ſo that the ideas of the one ſhall always introduce to the mind the ideas of the other; and this chain of aſſociation may paſs from the earlieſt event which we diſtinctly remember through all the intermediate years of our lives down to the inſtant when memory is exerted.

To this account of memory it may perhaps be objected, that it gives us no diſtinct notion of time. Every-thing that is remembered is neceſſarily believed to have been preſent in ſome portion of paſt time; but aſſociation brings into view nothing but a ſeries of events. This objection will be ſeen to have no weight when we have inquired into the nature of time, and aſcertained what kind of a thing it is. It will then perhaps appear, that duration itſelf, as apprehended by us, is not diſtinguiſhable from a ſeries of events; and that if there were no train of thought paſſing through our minds, nor any motion among the objects around us, time could have no exiſtence. Meanwhile, whatever become of this opinion, we beg leave to obſerve, that our theory of remembrance is perfectly conſiſtent with the commonly received notions reſpecting time; and indeed, that it is the only theory which can account for numberleſs phenomena reſpecting paſt duration. It is univerſally allowed, that if motion or a ſucceſſion of events do not conſtitute time, it is the only thing by which time can be meaſured. Now it is a fact which no man will deny, that the diſtance of time from the preſent *now* or inſtant to the earlieſt period which he diſtinctly remembers, appears to his view extremely ſhort, much ſhorter than it is ſaid to be in reality; and that one year, when he looks forward, appears longer than two, perhaps longer than ten, when he looks backward. Upon our principles this fact is eaſily accounted for. We remember nothing which is not linked by a chain of aſſociations with the perceptions of the preſent moment; and as none but a few of the moſt important events of our lives can be linked together in this manner, it hence follows, that events which, in the order of ſucceſſion, were far *diſtant* from each other, muſt thus be brought *together* in the memory, and the whole chain be contracted within very ſhort limits. But when we figure to ourſelves a ſeries of future events, we employ the active power of fancy inſtead of the paſſive capacity of retention; and can therefore bring within the compaſs of one periodical revolution of the ſun a longer ſeries of imaginary events ſucceeding each other, than is preſerved of real events in our memory from the earlieſt period of our exiſtence. So perfectly does our theory accord with this well known fact. On the other hand, if memory be an original faculty of the mind totally independent of aſſociation, and of which no other account is to be given than that it neceſſarily commands our belief, why is it a faculty which, with regard to duration, thus uniformly deceives us? and how comes it to paſs, that to a man whoſe memory is tenacious, who has read much, ſeen many countries, and been engaged in various occurrences, any determinate portion of paſt time always appears longer than to another man whoſe memory is feeble, and whoſe life has been waſted in eaſe and idleneſs? To theſe queſtions we know not what anſwer can be given upon any other principle than that which makes the evidence of memory depend upon aſſociation. But if we remember nothing but what is linked to the perception or idea which is preſent with us at the time of remembrance, and if duration be meaſured by the ſucceſſion of events, it is obvious that any portion of paſt time muſt neceſſarily appear longer to him who has many ideas aſſociated in his mind than to him who has but few.

102 The importance of aſſociation in the philoſophy of the human mind.

There is not perhaps a ſingle fact of greater importance in the philoſophy of the human mind than the *aſſociation of ideas*; which, when thoroughly underſtood, accounts for many of thoſe phenomena which ſome late writers of name have, with injury to ſcience and with danger to morality, attributed to a number of diſtinct and independent inſtincts. It is for this reaſon that we have conſidered it ſo minutely, and dwelt upon it ſo long; and in addition to what we have ſaid on the ſubject, we beg leave to recommend to our more philoſophical readers the diligent ſtudy of Hartley's Obſervations on Man (R). In that work we think ſeveral things are taken for granted which require proof; and ſome which, we are perſuaded, have no foundation in nature: but, with all its defects, it has more merit than any other treatiſe on the ſenſitive part of human nature with which we are acquainted.

CHAP. VI. *Of* CONSCIOUSNESS *and* REFLECTION.

103 Conſciouſneſs, what it is, and what are its objects.

SENSATION, remembrance, ſimple apprehenſion, and conception, with every other actual energy or paſſion of the mind, is accompanied with an inward feeling or perception of that energy or paſſion; and that feeling or perception is termed *conſciouſneſs*. *Conſciouſneſs* is the perception of what paſſes in a man's own mind at the *inſtant* of its paſſing there; nor can we *ſee*, *hear*, *taſte*, *ſmell*, *remember*, *apprehend*, *conceive*, employ our faculties in any manner, enjoy any pleaſure, or ſuffer any pain, without being *conſcious* of what we are doing, enjoying, or ſuffering. *Conſciouſneſs* is only of things *preſent* *; and to apply it to things *paſt*, is to confound *conſciouſneſs* with memory or *reflection*. One cannot ſay that he is conſcious of what he has ſeen or heard and now remembers: he is only conſcious of the act of remembrance; which, though it reſpects a paſt event, is itſelf a preſent energy. It is likewiſe to be obſerved that conſciouſneſs is only of things in the mind or conſcious being, and not of things external. It is improper in any perſon to ſay that he is *conſcious* of the table before him: he perceives it, he *ſees* it; and he may with great propriety ſay that he is *conſcious* he perceives or ſees it; but he cannot ſay that he is conſcious of the table itſelf, for it is only his immediate energy of perception that can be the object of conſciouſneſs. All the operations of our minds are attended with conſciouſneſs; which is the only evidence that we have or can have of their exiſtence. Should a man take it into his head to think or to ſay that his conſciouſneſs may deceive him, and to require a proof that it cannot, we know of no proof that can be given him; he muſt be left to himſelf as a man that denies firſt principles, without which there can be no reaſoning. Every attempt to prove this point, or to ſet it in a clearer light, would only ſerve to render it more dark and unintelligible. I *think*, I *feel*, I *exiſt*, are firſt truths, and the baſes of all human knowledge.

104 Des Cartes's argument from conſciouſneſs for his own exiſtence.

This has given riſe to the queſtion, whether Des Cartes did not fall into an abſurdity when, inferring his own exiſtence from his actual thought, he ſaid, *Cogito, ergo ſum*? This argument has been called a pitiful ſophiſm, and a *petitio principii*; becauſe, before a man take it for granted that he thinks, he muſt alſo, it is ſaid, take it for granted that he exiſts, ſince there cannot be thought where there is no exiſtence. Now it muſt be confeſſed, that if Des Cartes pretended by this argument to give us a freſh conviction of our own exiſtence, his endeavours were uſeleſs and puerile; becauſe a man capable of being convinced by the arguments of another, muſt have a previous conviction of his own exiſtence: but the argument itſelf is certainly neither a ſophiſm nor a *petitio principii*. Thoſe* who defend Des Cartes aſſert, that there is no reaſon to doubt the truth of their aſſertion, that his only view in urging ſuch an argument was not to prove the truth of our exiſtence, but to exhibit the order of that proceſs by which we arrive at the knowledge of the fact; and this he has very clearly done by analyſing the truth into its firſt principles. A ſtone exiſts as well as the human mind; but has the ſtone any knowledge of its own exiſtence? No man will ſay that it has; neither ſhould we have any knowledge of ours, did we think as little as the ſtone. We certainly *might* exiſt without thinking, as it is probable we do in very ſound ſleep; and in that ſtate our exiſtence might be known to other beings, but it could not poſſibly be known to ourſelves: for the only things of which the mind is conſcious, or has immediate knowledge, are its own operations. I *exiſt* is therefore a legitimate inference from the propoſition I *think*; and the obſervation that it is ſo may be uſeful to ſhow us the procedure of the mind in the acquiſiton of knowledge; but it has little merit as an argument, and ſtill leſs as a diſcovery, though, being ſtrictly true and juſt, it ſhould never have been expoſed to ridicule.

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* Reid's Eſſays on the Intellectual Powers of Man.

(R) Since this was written Mr Stewart's *Elements of the Philoſophy of the Human Mind* have been publiſhed; in which the reader will find many excellent remarks on the nature and influence of the aſſociating principle.

105 Reflection, what it is, and how different from conſciouſneſs.

It is to be obſerved, that we are conſcious of many things to which we give very little attention. We can hardly attend to ſeveral things at the ſame time; and our attention is commonly employed about that which is the *object* of our thought, and rarely about the thought itſelf. It is in our power, however, when we come to the years of underſtanding, to give attention to our own thoughts and paſſions, and the various operations of our minds. And when we make theſe the objects of our attention, either while they are preſent, or when they are recent and freſh in our memory, we perform an act of the mind which is properly called *reflection*. This *reflection* ought to be diſtinguiſhed from *conſciouſneſs**, with which it is confounded ſometimes by Locke, and often by the learned author of Ancient Metaphyſics. All men are *conſcious* of the operations of their own minds at all times while they are awake, nor does it appear that brutes can be wholly deſtitute of conſciouſneſs; but there are few men who *reflect* upon the operations of their minds, or make them the objects of thought; and it is not probable that any ſpecies of brutes do ſo.

From infancy, till we come to the years of underſtanding, we are employed ſolely about ſenſible objects. And although the mind is conſcious of its operations, it does not attend to them; its attention is turned ſolely to the objects about which theſe operations are employed. Thus, when a man is angry, he is *conſcious* of his paſſion; but his *attention* is turned to the *perſon* who offended him and the *circumſtances* of the *offence*, while the *paſſion of anger* is not in the leaſt the object of his attention. The difference between *conſciouſneſs* and *reflection*, is like the difference between a ſuperficial view of an object which preſents itſelf to the eye while we are engaged about ſomething elſe, and that attentive examination which we give to an object when we are wholly employed in ſurveying it. It is by conſciouſneſs that we immediately acquire all the knowledge which we have of mental operations; but attentive reflection is neceſſary to make that knowledge accurate and diſtinct. *Attention* is a voluntary act; it requires ſome exertion to begin and continue it; and by great exertion it may be continued for a conſiderable time; but *conſciouſneſs* is involuntary, and of no continuance, changing with every thought. The power of reflection upon the operations of their own minds does not at all appear in children. Men muſt have come to ſome ripeneſs of underſtanding before they are capable of it. Of all the powers of the human mind it ſeems to be the laſt that unfolds itſelf. Moſt men ſeem incapable of acquiring it in any conſiderable degree; and many circumſtances conſpire to make it to all men an exerciſe of difficulty. The difficulty, however, muſt be conquered or no progreſs can be made in the ſcience of our own or of other minds.

106 All our notions of mental energies got by reflection.

All the notions which we have of mind and of its operations are got by reflection; and theſe notions are by Mr Locke called *ideas of reflection*. This term we think extremely ill choſen; and we believe it has been the ſource of much error and confuſion among Locke's followers. A man, by attending to the operations of his own mind, may have as diſtinct *notions* of remembrance, of judgment, of will, of deſire, as of any object whatever: but if the ſecondary perception of a ſenſible object, that appearance which it has to the mind when viewed in the memory or imagination, be properly called an *idea*, it is certain that of the operations of the mind itſelf there can be no ideas; for theſe operations, when reflected on, make no appearance without their objects either in the memory or in the imagination. Nothing is more evident, in fact, than that we have no *ideas*, in the original and proper meaning of the word, but of ſenſible objects, upon which the mind exerts its firſt operations. Of theſe operations we have indeed a conſciouſneſs; but abſtracted from their objects we cannot frame of them any idea of reſemblance. We are *conſcious* to ourſelves of *thinking*, *willing*, *remembering*, *diſcerning*, *reaſoning*, *judging*, &c. but let any one look into himſelf, and try whether he can there find any *idea* of *thinking* or *willing*, &c. entirely ſeparate and abſtracted from the *object* of thought or will. Every man who has ſeen a tree or a houſe, will find in his mind ideas of theſe objects, which he can contemplate by themſelves, independent of every thing elſe; but no man can contemplate the *idea* of thinking or deſiring without taking into view the thing thought on or deſired. It is plain, therefore, that the energies of *thinking*, *willing*, and *deſiring*, with all their various modifications, are not themſelves *ideas*, or capable of *communicating* ideas to be apprehended, as the ideas of bodies are apprehended by the pure intellect. They are the *actions* and *workings* of the *intellect itſelf* upon ideas which we receive from the objects of ſenſe, and which are treaſured up in the memory or imagination for the very purpoſe of furniſhing the intellect with materials to work upon. Between *ideas* and the *energies of thinking* there is as great and obvious a difference as there is between a *ſtone* and the *energies* of him by whom it is cut. Ideas are the paſſive ſubjects; the energies of thinking are the operations of the agents. Ideas are relicts of ſenſation, and have a neceſſary relation to things external; the energies of thinking are relicts of nothing, and they are wholly and originally internal.

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* See Buffier's Firſt Truth.

* Reid's Eſſays on the Intellectual Powers of Man.

107 Our knowledge of the operations of intellect immediate and not by the intervention of ideas.

That we can in no ſenſe of the word be ſaid to have *ideas* of the operations of the intellect, will be ſtill more evident if we conſider by what means we acquire the knowledge which we have of thoſe operations. It has been already obſerved, that when our thoughts are employed upon any ſubject, though we are conſcious of thinking, yet our *attention* is commonly employed upon the *object* of our thought, and not upon the *thought* itſelf: and that if we would give attention to our thoughts and paſſions, we muſt do it by a reflex act of the mind, whilſt the act of thinking is ſtill recent and freſh in our memory. Thus, if a man wiſhes to know what perception is, it is not the time to make the inquiry while he is looking at ſome rare or beautiful object; for though he is *conſcious* of the energy of perceiving, the *object* of perception employs all his *attention*. But the time to make this enquiry is either when the object has become familiar to him, or preſently after it is removed from his ſight. In the former caſe, he can look upon it without emotion, pay attention to every ſtep in the proceſs of perception, and be immediately conſcious what perception is. In the latter caſe, by turning his attention inwards, and reflecting on what he did or felt when the object was before him, he will find clear and vivid ideas of every thing which he perceived by his ſenſe of ſight; but he will find no *idea* of the act of *ſeeing* or *perceiving*. On the contrary, if he be capable of ſufficient attention, he will obſerve that his intellect is employed in the very ſame manner upon the *ideas* that it was upon the original *ſenſations*; and of that employment, and the manner of it, he will be equally conſcious as he was of the original energy exerted in ſenſation. There is indeed this difference between the two, without which reflection could make no diſcoveries, that the moſt vivid ideas being ſtill faint when compared with actual ſenſations, the intellect is not ſo wholly engroſſed by them as it was by the original objects, nor is it ſo rapidly carried from idea to idea as it was from ſenſation to ſenſation. It is thus at leiſure to attend to its own operations, and to know what they are; though to form *ideas* of them as ſeparate from their objects, is abſolutely impoſſible. Every man capable of paying attention to what paſſes within himſelf when he ſees, hears, and feels, &c. may have very accurate *notions* of *ſeeing*, *hearing*, and *feeling*, &c. but he cannot have *ideas* of them as he has of the *objects* of *ſight*, *hearing*, and *touch*.

The ſame is the caſe with reſpect to the exertion of our reaſoning faculties. A man muſt have diſtinct and clear *ideas* to reaſon upon, but he can have no *idea* of reaſoning itſelf, though he muſt be conſcious of it, and by attention may know what it is. When a man ſits down to ſtudy for the *firſt time* a propoſition in the Elements of Euclid, he certainly employs his reaſoning faculty, and is conſcious that he is doing ſo; but his attention is wholly turned to the diagram before him, and to the ſeveral ideas which the diagram ſuggeſts. Afterwards when he has maſtered the propoſition, he may go over it again, with a view to diſcover what reaſoning is; but he will not find he has any *idea* of reaſoning as he has of the diagram. He will only exert that faculty a ſecond time, and perceive one truth linked to and depending upon another in ſuch a manner that the whole taken together forms a complete demonſtration. In a word, the operations of our own minds, when attention is paid to them are, known immediately by conſciouſneſs; and it is as impoſſible that we ſhould have ideas of them, as that a living man ſhould be a picture upon canvas. He who attends to what paſſes in his own mind when he perceives, remembers, reaſons, or wills, muſt know by conſciouſneſs what theſe operations are, and be capable of forming very accurate notions of them, as connected with their objects; and he who does not attend to what paſſes in his own mind will never acquire any notions of them, though he were to read all that has been written on the ſubject from the days of Pythagoras to thoſe of Dr Reid.

108 There are things which we know partly by ſenſation and partly by reflection, &c.

As we acquire ideas of external objects by means of our ſenſes; and notions of perceiving, remembering, reaſoning, and willing, &c. by reflecting on the operations of our own minds; ſo are there other things of which we acquire notions, partly by ſenſation, partly by reflection, and partly by means of that faculty of which it is the more peculiar office to compare ideas and to perceive truth. Such are *ſubſtance*, *body*, *mind*, with their ſeveral qualities, adjuncts, and relations; the knowledge of which, as has been already obſerved, conſtitutes what in ſtrictneſs of ſpeech is termed the ſcience of *metaphyſics*. Theſe ſhall be conſidered in order, after we have inveſtigated the nature of truth, and inquired into the ſeveral ſources of evidence; but there is one notion, about the origin and reality of which there have been ſo many diſputes, which in itſelf is of ſo great importance, and which will be ſo intimately connected with all our ſubſequent inquiries, that it may not be improper to conſider it here.—The notion to which we allude is of POWER.

109 Our notion of power how acquired.

Among the objects around us we perceive frequent changes, and one event regularly ſucceeding another. Gold thrown into the fire is changed from a fixed to a fluid body. Water expoſed to a certain degree of cold is changed from a fluid to a fixed body. Night ſucceeds to day, and ſummer ſucceeds to winter. We are conſcious of new ſenſations in ourſelves every hour. We are likewiſe conſcious of reaſoning, willing, and deſiring; and we know that by an exertion of will we can riſe or ſit, ſtand ſtill or walk, call one idea into view, and diſmiſs others from our contemplation. Experience teaches us, that it is not occaſionally, but always, that gold is changed into a fluid by being thrown into the fire, and water into a fixed body by being expoſed to a certain degree of cold; that night ſucceeds to day, and ſummer to winter. Theſe changes have regularly taken place ſince the creation of the world; and it has never once been obſerved that water was fixed by fire, or gold rendered liquid by cold. Were we not aſſured by experience that our own voluntary motions are produced by exertions of our minds, of which we are conſcious, and that without ſuch

Of Conſciouſneſs and Reflection.

ſuch exertions thoſe motions would never have taken place, we ſhould probably have conſidered the liquifaction of gold as an event equally independent of fire, though uniformly conjoined with it, as night is independent of day and day of night. But having experienced that we can move and not move our bodies as we pleaſe; that when it is our will to ſit, we never get up to walk; and that when we wiſh to walk, we always do it except prevented by external violence; having likewiſe experienced, that by a thought, by ſome internal and inexplicable, exertion of our minds, we can call up in our memory or imagination one idea and diſmiſs others from our mental view; we are led to believe with the fulleſt conviction, that all thoſe motions of our bodies which in common language are termed *voluntary* and that ſucceſſion of ideas which follows a conſcious exertion of the mind, depend upon ourſelves. In other words, we are neceſſitated to believe that we have a *power* to move or not move our bodies in many caſes, and a *power* to turn our attention to one idea in preference to others.

It is thus that we acquire the notion of *power* in ourſelves, which we eaſily transfer to other objects. Knowing that the various motions of our bodies thus effected proceed from power, we are naturally led to inquire whether the changes which we perceive in other bodies may not proceed from *power* likewiſe *i. e.* from ſomething analogous to that power, of the exertions of which we are conſcious in ourſelves. Now uniform experience teaching us that gold is liquified by being thrown into the fire, and that water is fixed by being expoſed to cold; we infer with the utmoſt certainty that there are *powers* in fire and cold to produce theſe changes, and that without the exertion of ſuch *powers* theſe changes, would not be produced. We cannot indeed ſay of external powers, as we can of our own, in what ſubſtance they inhere. We know with the utmoſt certainty that the voluntary motions of our hands, &c. are produced by a power not inherent in the hands but in the mind, for of the exertion of that power we are conſcious; but we do not know whether the power which liquifies gold be inherent in that ſenſible object which we call *fire*, or in ſomething elſe to which fire is only an inſtrument. We learn by obſervation, that the minute particles of fire or heat inſinuate themſelves between the particles of gold, and if we may uſe the expreſſion, tear them aſunder; but whether they do this in conſequence of a *power* inherent in themſelves, or only as inſtruments impelled by another *power*, is a queſtion which *obſervation* cannot enable us to anſwer.

Were we not conſcious of the exertion of our own powers, it ſeems not conceivable that we could ever have acquired any notion of power at all; for power is not an object of ſenſe, nor, independent of its operations, is it indeed an object of conſciouſneſs. In external operations, all that we perceive is *one thing*, in which we ſuppoſe the *power* to reſide, followed by another, which is either the *change* or that on which the change is *produced;* but the exertion of the power itſelf we do not perceive. Thus we perceive gold, after it has been ſome time in the fire, converted from a fixed to a fluid body; but we perceive not by our ſenſes either the power or the energy of the power which operates to this converſion. In the exercife of our own power, the caſe is otherwiſe. When a man puts his hand to his head, and afterwards thruſts it into his boſom, he not only perceives by his ſenſes the change of poſition, but is alſo conſcious of the energy or exertion by which the change was produced.

"Suppoſe (ſays Mr Hume †) a perſon, though endowed with the ſtrongeſt faculties of reaſon and reflection, to be brought on a ſudden into this world; he would indeed immediately obſerve a continual ſucceſſion of objects, and one event following another, but he would not be able to diſcover any thing farther. He would not at firſt by any reaſoning be able to reach the idea of cauſe and effect; ſince the particular powers by which all natural operations are performed never appear to the ſenſes. The impulſe of one billiard ball is attended with motion in the ſecond. This is the whole that appears to the *outward* ſenſes. The mind feels no ſentiment or *inward* impreſſion from this ſucceſſion of objects; conſequently there is not, in any ſingle particular inſtance of cauſe and effect, any thing which can ſuggeſt the idea of power or neceſſary connection. From the firſt appearance of an object, we never can conjecture what effect will reſult from it: but, were the power or energy of any cauſe diſcoverable by the mind, we could foreſee the effect even without experience; and might at firſt pronounce with certainty concerning it by the mere dint of thought and reaſoning. It is impoſſible, therefore, that the idea of power can be derived from the contemplation of bodies in ſingle inſtances of their operations; becauſe no bodies ever diſcover any power which can be the original of this idea."

There is a ſenſe in which this reaſoning is unqueſtionably juſt. A man who had never been conſcious of exerting power in himſelf, would certainly not acquire the notion of power from obſerving a continual ſucceſſion of external objects. The impulſe of one billiard ball being followed by the motion of another, would no more lead him to the notion of power in the former, than the ſucceſſion of night to day would lead him to the notion of a power in light to produce darkneſs. When Mr Hume ſays, "that from the *firſt* appearnce of an object *we* can never conjecture what effect will reſult from it." he uſes language that is ambiguous, and utters an aſſertion which is either true or falſe according to the ſenſe in which it is underſtood. If it be meant, that after having reflected on the operations of our own minds, and learned by experience that motion is communicated by impulſe from one ball of ivory to another, we could not conjecture whether a ſimilar effect would be produced by the impulſe of balls made of other hard bodies which we had never before ſeen, the aſſertion is manifeſtly falſe. A man who had but once ſeen motion communicated in this manner from one *ivory* ball to another, would certainly conjecture that it might be communicated from one *wooden* ball to another; and if he had ſeen it repeatedly communicated from one ball to another of different ſubſtances, he would infer, with the utmoſt confidence, that it might be communicated from ball to ball of whatever ſubſtance compoſed, provided that ſubſtance be hard, or of a ſimilar texture with the balls to the impulſe of which he had formerly paid attention.

† Eſſays.

attention. If by this ambiguous phraſe the author only means, as is probably the caſe, that from the firſt appearance of an object to which we had never before obſerved any thing in any reſpect ſimilar, we could not conjecture what effect would reſult from it; or if his meaning be, that a man ſuddenly brought into the world, who had never acquired ſuch a notion of power as may be had from attention to the energies and operations of our own minds, would not, by obſerving an effect to reſult from one body, conjecture from the firſt appearance of another ſimilar body what effect would reſult from it; in either of theſe caſes his aſſertion is certainly true, and tends to prove, that without the conſciouſneſs of the operations of our own minds we could never acquire a notion of power from the changes perceived by our ſenſes in external objects.

110
Mr Hume attempts to prove that we can have no notion whatever of power.

But Mr Hume, not contented with denying, which he might juſtly do, that we could ever have derived the idea of power merely from obſerving the continual ſucceſſion of external objects, labours hard to prove that we have no notion of power at all, and that when we uſe the word *power*, we do nothing more than utter an inſignificant ſound. To pave the way for the arguments by which ſo extravagant a paradox is to be ſupported, he lays it down as a "propoſition which will not admit of much diſpute, that all our ideas are nothing but copies of our impreſſions; or, in other words, that it is impoſſible for us to *think* of any thing that we have not antecedently *felt* either by our external or internal ſenſes." As this propoſition, however, will admit, it ſeems of *ſome* diſpute, he takes care, before he applies it to the purpoſe of demoliſhing all power, to ſupport it by two arguments. "Firſt (ſays he), when we analyſe our thoughts or ideas, however compounded or ſublime, we always find that they reſolve themſelves into ſuch ſimple ideas as were copied from a precedent feeling or ſentiment. Thoſe who would aſſert, that this poſition is not univerſally true nor without exception, have only one, and that an eaſy, method of refuting it; by producing that idea, which, in their opinion, is not derived from this ſource. Secondly, If it happen, from a defect of the organ, that a man is not ſuſceptible of any ſpecies of ſenſation, we always find that he is as little ſuſceptible of the correſpondent ideas. A blind man can form no notion of colours, a deaf man of ſounds. And tho' there are few or no inſtances of a like deficiency in the mind, where a perſon has never felt, or is wholly incapable of a ſentiment or paſſion that belongs to his ſpecies; yet we find the ſame obſervation to take place in a leſs degree. A man of mild manners can form no idea of inveterate revenge or cruelty; nor can a ſelfiſh heart eaſily conceive the heights of friendſhip and generoſity."

111
His two propoſitions hypothetical.

As theſe propoſitions are the engines by which all power is baniſhed from the world, it may not be improper, before we proceed to inquire by what means they perform ſo arduous a taſk, to conſider their own inherent ſtrength; for if they be weak in themſelves, their work, however dexterouſly they may be employed, can have no ſtability. We have already noticed the perverſeneſs of this writer's language, when it confounds *ſenſations* with *impreſſions*; but here it is ſtill more perverſe, for paſſions, ſentiments, and even *conſciouſneſs*, are ſtyled *impreſſions*. When ſenſations are confounded with impreſſions, the effect is only miſtaken for the cauſe, it being univerſally known that ſenſations proceed from impreſſions made upon the organs of ſenſe. When conſciouſneſs is confounded with an impreſſion, one thing is miſtaken for another, to which it is univerſally known to have neither reſemblance nor relation. But, not to waſte time upon theſe fallacies, which, though dangerous if admitted, are yet too palpable to impoſe upon a reader capable of the ſlighteſt attention, let us examine the propoſitions themſelves. The moſt important, and that for the ſake of which alone the others are brought forward, is, that it is impoſſible for us to *think* of any thing that we have not immediately *felt*, either by our external or internal ſenſes." Did Mr Hume then never *think* of a mathematical *point*, or a mathematical *line*? Neither of theſe things is capable of being *felt* either by making an impreſſion upon the organs of ſenſe or as an object of conſciouſneſs; and therefore it is impoſſible that he ſhould ever have had ideas of them ſuch as he doubtleſs had of ſenſible objects; yet in the moſt proper ſenſe of the word *think* (s), he certainly thought of both points and lines; for he appears to have made conſiderable progreſs in the ſcience of geometry, in which he could not have proceeded a ſingle ſtep without a perfect knowledge of theſe things, on which the whole ſcience is built. It is not therefore true, that our thoughts or ideas, when analyſed, always reſolve themſelves into ſuch ſimple ideas as were copied from a precedent feeling or ſentiment; for every mathematical figure of which we can think reſolves itſelf into a point and motion; and a point having no parts and no magnitude, cannot poſſibly be the object of feeling to any of our ſenſes. If, therefore, ideas alone be the objects of thought, we have refuted Mr Hume's poſition by the very method which he himſelf lays down; for we have produced an idea which is not derived either from a precedent feeling or a precedent ſentiment. By ſentiment, we ſuppoſe to be here meant that which by other philoſophers is denominated conſciouſneſs; and of conſciouſneſs it is undeniable that nothing is the object but the actual energies of our own minds.

112
Things of which we can have no ideas may themſelves be the objects of thought.

But ideas are not the only objects of thought. We have already given our reaſons for reſtricting the word *idea* to that appearance which an object of ſenſe, when reflected on, makes either in the memory or imagination. Such was undoubtedly its original ſignification; and had it never been uſed to denote other and very different objects, much error and perplexity would have been avoided, which now diſgrace the ſcience of metaphyſics. Things may *themſelves* be the objects of thought; and

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(s) *Thinking*, in the propriety of the Engliſh tongue, ſignifies that ſort of operation of the mind about its ideas wherein the mind is active; where it, with ſome degree of voluntary attention, conſiders any thing. *Locke.*

Of Conſciouſneſs and Reflection

and when that is the caſe, to think of their *ideas*, were it poſſible to do ſo, would be worſe than uſeleſs; for we may certainly know a man better by looking at himſelf than by looking at his picture. Of things which are *themſelves* the objects of thought, we have either a *direct* or a *relative* knowledge. We know directly the actual operations of our own minds by the moſt complete of all evidence, that of conſciouſneſs; and we have a *relative* notion of mathematical points and lines: but neither of mental energies nor of theſe external things (T) can we poſſibly have any *idea*.

113 We have only relative notions of ſome things,

† Eſſays on the Active Powers of Man.

It is well obſerved by Dr Reid †, that our notions both of body and mind are nothing more than relative. "What is body? It is, ſay philoſophers, that which is extended, ſolid, and diviſible. Says the queriſt, I do not aſk what the properties of body are, but what is the thing itſelf? let me firſt know directly what body is, and then conſider its properties. To this demand I am afraid the queriſt will meet with no ſatisfactory anſwer; becauſe our notion of body is not direct, but relative to its qualities. We know that it is ſomething extended, ſolid, and diviſible, and we know no more. Again, if it ſhould be aſked, what is mind? It is that which thinks. I aſk not what it does, or what its properties are, but what it is? To this I can find no anſwer; our notion of mind being not direct, but relative to its operations, as our notion of body is relative to its qualities (U)."

114 About which, however, we can reaſon with the utmoſt preciſion:

Our notion of a mathematical point is of the very ſame kind. What is a point? It is, ſays Euclid, that which hath no parts and no magnitude. Replies the queriſt, I aſk not either what it has or what it has not let me firſt know what it is? To this ſecond queſtion, it might perhaps be anſwered, that a mathematical point is that which by motion generates a line. But, rejoins the queriſt, I am not inquiring what it generates; give me a direct idea of the point itſelf; or, if that cannot be done, as ſurely it cannot, tell me what its offspring a line is? A line, ſays Euclid, is length without breadth. I have no idea, replies the queriſt, of length without breadth. I never felt an *impreſſion* from a ſenſible object which did not ſuggeſt length, breadth, and thickneſs, as inſeparably united; and I can have no idea which is not the copy of a *former impreſſion*. To aſſiſt the queriſt's conception, it may be ſaid that lines are the boundaries of a ſuperficies, and that ſuperficies are the boundaries of a ſolid body; but of a ſolid body every man has a clear and direct idea, in the moſt proper ſenſe of the word. Here then are ſeveral things, viz. points, lines, and ſuperficies, of not one of which is it poſſible to form a direct notion; and yet we know them ſo thoroughly, from the relation which they bear to other objects, that we can reaſon about them with a preciſion and certainty which only the mathematical ſciences admit.

115 And ſuch is power.

The great advantage of theſe ſciences above the moral, Mr Hume himſelf expreſsly admits: but he attributes it to a wrong cauſe, when he ſays it conſiſts in this, that the "ideas of the former being *ſenſible* are always clear and determinate;" for we ſee that the notion of a point or of a line is merely relative, and cannot poſſibly be the copy of a ſenſation, or, in his language, of a ſenſible impreſſion. If then we have clear and determinate notions of points and lines, and may reaſon about them without ambiguity, as he acknowledges we may, what is there to hinder us from having an equally clear and determinate notion of power, or from reaſoning about it with as little ambiguity (V)? Why, ſays he, we are not conſcious of power. And to prove this poſition, which needs no proof, he makes

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(T) By calling mathematical points and lines external things, we do not mean to attribute to them any corporeal exiſtence. We know well that they are merely creatures of the mind, and that if there were no mind, they could have no exiſtence. But twenty men may at the ſame inſtant have a notion of the ſame lines and the ſame points; and therefore theſe lines and points have an exiſtence independent of, and external to, any *one* mind, at leaſt to any one *human* mind. The objects, however, of which a man is conſcious, are in no ſenſe whatever external, for they are preſent to no human mind but his own.

(U) The opinions of philoſophers concerning corporeal and ſpiritual ſubſtances ſhall be conſidered more fully hereafter. In quoting from Dr Reid on another ſubject, we have been obliged to anticipate his opinion, which will be found to be not more modeſt than juſt.

(V) "There are ſome things of which we can have both a direct and relative conception. I can directly conceive ten thouſand men, or ten thouſand pounds, becauſe both are objects of ſenſe, and may be ſeen. But whether I ſee ſuch an object, or directly conceive it, my notion of it is indiſtinct; it is only that of a great multitude of men, or of a great heap of money; and a ſmall addition or diminution makes no perceptible change in the notion I form in this way. But I can form a relative notion of the ſame number of men or of pounds by attending to the relations which this number has to other numbers greater or leſs. Then I perceive that the relative notion is diſtinct and ſcientific; for the addition of a ſingle man, or a ſingle pound, or even of a penny, is eaſily perceived. In like manner, I can form a direct notion of a polygon of a thouſand equal ſides and equal angles. This direct notion cannot be more diſtinct when conceived in the mind, than that which I get by ſight when the object is before me; and I find it ſo indiſtinct that it has the ſame appearance to my eye, or to my *direct* conception, as a polygon of a thouſand and one, or of nine hundred and ninety-nine ſides. But when I form a *relative* conception of it, by attending to the relation it bears to polygons of a greater, or leſs number of ſides, my notion of it becomes diſtinct and ſcientific, and I can demonſtrate the properties by which it is diſtinguiſhed from all other polygons. From theſe inſtances it appears, that our relative conceptions of things are not always leſs diſtinct, nor leſs fit materials for accurate reaſoning, than thoſe that are direct; and that the contrary may happen in a remarkable degree."

Reid's Eſſays on the Active Powers of Man.

makes many obſervations that, however juſt, might certainly have been ſpared. Of theſe one is, that "a man ſuddenly ſtruck with a palſy in the leg or arm, or who had now loſt theſe members, frequently endeavours at firſt to move them, and employ them in their uſual offices. Here he is as much conſcious of power to command ſuch limbs, as a man in perfect health is conſcious of power to actuate any member which remains in its natural ſtate and condition. But conſciouſneſs never deceives. Conſequently, neither in the one caſe nor in the other are we ever conſcious of any power." This is true; we never are conſcious of any power; but we are frequently conſcious of actual energies: and the man who, after being ſuddenly ſtruck with a palſy, endeavours in vain to move his leg or arm, is as conſcious of energy as he who in health makes the attempt with ſucceſs. Nor let it be imagined that his conſciouſneſs deceives him; for, as Mr Hume juſtly obſerves, conſciouſneſs never deceives. He is certain of the *energy*, but finds by experience that the *inſtrument* of this energy has ſuddenly become diſordered and unfit for its uſual office. In this and this alone conſiſts the difference between the paralytic and the man whoſe limbs are ſound. The one may be as conſcious of energy as the other, and his conſciouſneſs may be equally infallible. What then is this energy? Mr Hume will not ſay that it is an *idea*, for it is not the copy of any antecedent impreſſion; beſides, he has ſomewhere allowed that ideas are never active. Is it then a ſubſtance? Impoſſible! for it is not permanent: and we believe no man will venture to affirm, or even to ſuppoſe, that the ſame ſubſtance can be repeatedly annihilated, and as often created. Is it then the occaſional exertion of ſome ſubſtance? This muſt be the truth; for no other ſuppoſition remains to be made. If ſo, that ſubſtance muſt be poſſeſſed of *power;* for a capacity of exerting actual energy is all that is meant by the word *power*.—"Wherever there is a *capability* of energy or exertion, there muſt be *power;* for though there can be no exertion without power, there may be power that is not exerted *. Thus a man may have *power* to ſpeak when he is ſilent; he may have power to riſe and walk when he ſits ſtill. But though it be one thing to *ſpeak* and another to have the *power* of ſpeaking, we always conceive of the power as ſomething which has a certain relation to the effect; and of every power we form our notion by the effect which it is able to produce. Nor is it only in ſpeaking and moving his limbs that a man is conſcious of energy. There is as much energy, though of a different kind, in *thinking* as in *acting*. Hence the powers of the human mind have been divided into active and ſpeculative. By the former we move the body; and by the latter we ſee, hear, remember, diſtinguiſh, judge, reaſon, and perform upon our notions and ideas every other operation which is comprehended under the general word *to think*."

116
Locke's paſſive power an improper expreſſion.

Mr Locke † has introduced into his theory of power another diſtinction than that which we have made between active and ſpeculative powers. Obſerving by our ſenſes, under which on this occaſion memory is certainly included, various changes in objects, we collect, ſays he, a poſſibility in one object to be changed, and in another a poſſibility of making that change, and ſo come by that idea which we call power. Thus we ſay that fire has a power to melt gold, and that gold has a power to be melted. The firſt he calls *active*, the ſecond *paſſive*, power. But to ſay that the *poſſibility* of being changed is *power* ſeems to be a very improper mode of ſpeaking, and ſuch as may lead to conſequences which the excellent author certainly held in abhorrence. It tends to make unwary readers imagine that the paſſive ſubject is as neceſſary to the exiſtence of power, as the active being of which power is an attribute; but if the univerſe had a beginning, and if its Creator be immutable, two propoſitions which Mr Locke firmly believed, there certainly was power when there was no change, nor any thing exiſting which was capable of change. He owns, indeed, that active power is more properly called power than the other; but we ſee no propriety at all in paſſive power. "It is (in the language of Dr Reid) a powerleſs power, and a contradiction in terms."

117
Juſt obſervations of the ſame author reſpecting power as belonging to body or mind.

But though Locke here uſes improper terms, he has other obſervations with which we have the honour fully to agree, and which lead to conſequences the reverſe of that impiety which ſeems to follow from the notion of *paſſive* power. He obſerves, that "we have from body no idea at all of thinking, nor any idea of the beginning of motion. A body at reſt affords us no idea of any active power to move; and when it is ſet in motion itſelf, that motion is rather a paſſion than an action in it. For when the ball obeys the ſtroke of a billiard ſtick, it is not any action of the ball, but a paſſion; alſo, when by impulſe it ſets another ball in motion that lay in its way, it only communicates the motion it had received from another, and loſes in itſelf ſo much as the other received; which gives us but a very obſcure idea of an active power of moving in body, whilſt we obſerve it only to transfer, but not to produce any motion. So that it ſeems to me, we have from the obſervation of the operation of bodies by our ſenſes but a very imperfect obſcure idea of active power, ſince they afford us not any idea in themſelves of the power to begin any action either of motion or thought." He thinks it evident, however, "that we find in ourſelves a power to begin or forbear, continue or end, ſeveral actions of our minds and motions of our bodies, barely by a thought or preference of the mind ordering, or, as it were, commanding, the doing or not doing ſuch or ſuch a particular action. This power which the mind has thus to order the conſideration of any idea, or the forbearing to conſider it, or to prefer the motion of any part of the body to its reſt, and *vice verſa* in any particular inſtance, is that which we call *will.* The actual exerciſe of that power, by directing any particular action, or its forbearance, is that which we call *volition* or *willing*.

118
Whence it follows, that only ſuch beings as have will and underſtanding can poſſeſs real power.

According to Mr Locke, therefore, the only clear notion or idea we have of power is taken from the power which we find in ourſelves to give certain motions to our bodies, or certain directions to our thoughts; and this power in ourſelves can be brought into action only by willing or volition. This is exactly our doctrine; where we have endeavoured to prove, that without the conſciouſneſs of actual energy in ourſelves, we never could have acquired any notion at all of power from obſerving the changes which take place among external objects. But if this be ſo, if the *power*, of which alone we know any thing, can be brought

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* Reid's Eſſays on the Active Powers of Man.

† Eſſay, book ii. chap. 21.

Of Conſciouſneſs and Reflection.

into action only by willing or volition, and if will neceſſarily implies ſome degree of underſtanding, as in us it certainly does, it comes to be a queſtion of the firſt importance, whether any being which poſſeſſes not will and underſtanding can be poſſeſſed of real power, or be the efficient cauſe of any action. This queſtion we feel ourſelves compelled to anſwer in the negative. If *we* had not will, and that degree of underſtanding which will neceſſarily implies, it is evident that we could exert no power, and conſequently could have none: for power that cannot be exerted is no power. It follows alſo, that the power, of which alone we can have any diſtinct notion, can be only in beings that have underſtanding and will. Power to produce any effect, implies power not to produce it; and we can conceive no way in which power may be determined to one of theſe rather than the other in a being that has not will. We grow from infancy to manhood; we digeſt our food, our blood circulates, our heart and arteries beat; we are ſometimes ſick and ſometimes in health: all theſe things muſt be done by the power of ſome agent, but they are not done by our power. And if it be aſked how we know this? the anſwer is, becauſe they are not ſubject to our will. This is the infallible criterion by which we diſtinguiſh what is our doing from what is not; what is in our power from what is not. Human power can be exerted only by will: and we are unable to conceive any active power to be exerted without will. If, therefore, any man affirms that a being may be the efficient cauſe of an action which that being can neither conceive nor will, he ſpeaks a language which we do not underſtand. If he has a meaning, he muſt take the words *power* and *efficiency* in a ſenſe very different from ours; for the only diſtinct notion, indeed the only notion which we can form, of real efficiency, is a relation between the cauſe and the effect ſimilar to that between us and our voluntary actions. It ſeems therefore moſt probable, that ſuch beings only as have ſome degree of underſtanding and will can poſſeſs active power, and that inanimate beings muſt be merely paſſive. Nothing which we perceive without us affords any good ground for aſcribing active power to any inanimate being; and we can as little conceive ſuch a being poſſeſſed of power as we can conceive it capable of feeling pain. On the other hand, every thing which we diſcover in our own conſtitution, leads us to think that active power cannot be exerted without will and intelligence; and to affirm that it can, is to affirm what to us at leaſt is a contradiction in terms.

119
An objection obviated.

To this reaſoning, which is Dr Reid's*, and which to us appears unanſwerable, we have heard it objected, that a man born blind has the ſame evidence for the non-exiſtence of colour that is here urged for the impoſſibility of power being exerted without will and underſtanding. If the objection had not been made by a very acute man; we ſhould have deemed it altogether unworthy of notice; for between the two caſes ſuppoſed to be ſimilar there is hardly any analogy. A man born blind has no notion whatever of colour. If you deſcribe it to him in the beſt manner that you can, and refer it to any of the ſenſes which he poſſeſſes; if you ſay that it is the object of feeling, and that by feeling it one may perceive things at the diſtance of many miles; the blind man has reaſon to ſay that you are uttering a propoſition which he knows with the utmoſt certainty cannot poſſibly be true. But if you tell him that colour is the object of the ſenſe of ſight, a ſenſe which he poſſeſſes not; that it has not the leaſt reſemblance to the objects of the other ſenſes; and that perſons endowed with the ſenſe of ſight perceive coloured objects at the diſtance of many miles; the blind man cannot know whether what you ſay be true or falſe, becauſe he has no idea or conception of the things of which you ſpeak. This is not the caſe with reſpect to power; for every man who has reflected on the operations of his own mind has a very diſtinct notion of power, and knows perfectly, that to the actual exertion of the only power which he can conceive, will and underſtanding are neceſſary. Should it be ſaid that there may be power altogether different from that of which we have a diſtinct conception, we think it ſufficient to reply, that of a thing which cannot be conceived nothing can be either affirmed or denied; that activity exerted without will and underſtanding ought not to be called an exertion of *power*, becauſe power is the name already appropriated to the attribute of a being by which he can do certain things if he wills; that we can form no notion of a real efficient cauſe which has not will and underſtanding, ſo we have no reaſon to believe that ſuch a cauſe any where exiſts; and to ſay that power, ſuch as we can conceive, may be exerted without will and underſtanding, is as great an abſurdity as to ſay that there may be velocity without ſpace.

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But if active power, in its proper meaning, requires a ſubject endowed with will and intelligence, what ſhall we ſay of thoſe active powers which philoſophers teach us to aſcribe to matter, the powers of corpuſcular attraction, magnetiſm, electricity, gravitation, and others? Theſe powers, as they are called, ſhall be conſidered when we treat of the nature and ſource of corporeal motion. In the mean time, it is ſufficient to obſerve, that whatever the agents may be in the operations of nature, whatever the manner of their agency or the extent of their power, they depend upon the firſt cauſe, and are all under his control.

CHAP. VII. *Of* TRUTH, *and the different* SOURCES *of* EVIDENCE.

SECT. I. *Of Truth.*

BY purſuing theſe inquiries in the order which to us appears moſt natural, we are now led to the contemplation of thoſe faculties of the human mind of which *truth* is properly the object. But what is *truth?* This was a famous queſtion among the Greek ſophiſts; which had been ſo often agitated, and to which ſo many abſurd anſwers had been given, that it came at laſt to be doubted by men of the world whether a ſatisfactory anſwer could be given, or indeed whether the matter was worthy of inveſtigation. It is well known, that among the ancient philoſophers there was a ſect called from their principles *Sceptics*, and from their founder *Pyrrhonians*, who openly avowed their opinion that *truth*, like virtue, is nothing but a name; that all things are equally true, or rather equally doubtful; and that it is in vain for man to hope for certainty in any inquiry in which he can be engaged. Such ſcepticiſm as this no modern philoſopher has profeſſed; but many have had enough of it to make ſober men heſitate about defining truth, and even inſinuate that of truth no definition can be given. This ſurely is a miſtake. If truth cannot be defined, it ſtill wanders at large and in diſguiſe, and vain muſt be the purſuit of every man who endeavours to obtain it; he is purſuing he knows not what.

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* See Eſſays on the Active Powers of Man.

120
Truth defined.

So obvious and ſo ſolid is this reflection, that almoſt every philoſopher of merit who has lately written on the nature of evidence has begun his work, if not with a formal definition, with ſomething at leaſt equivalent to a definition of the object of his purſuit. To repeat all theſe definitions could ſerve no other purpoſe than to ſwell this article to a diſproportioned bulk, and to perplex perhaps the mind of the reader. We ſhall therefore content ourſelves with that which is given by Mr Wollaſton. "Thoſe propoſitions (ſays he) are true which repreſent things as they are: or, truth is the conformity of thoſe words or ſigns by which things are expreſſed to the things themſelves." Notwithſtanding the objections of a very learned and acute writer (w), this is the beſt definition of *truth* which we have met with in any language. It is conciſe and perſpicuous. It comprehends all kinds of truth, as well that which is merely mental, the ſubject of ſilent contemplation, as that which is communicated either by written language or by the living voice: and it makes truth itſelf immutable, as depending not upon the arbitrary conſtitution of this or that individual, or even of the whole human race (x), but upon the nature of things as eſtabliſhed by their Almighty Creator.

121
Every propoſition either true or falſe.

According to this definition, every propoſition which

(w) Dr Tatham having aſked, with a contemptuous air, How imperfect and illogical is the definition of truth given by Wollaſton? proceeds, though not to define, to deſcribe or characteriſe it himſelf. "Truth (ſays he) is of the nature and eſſence of God, like him *incomprehenſible* in the whole, and *ineffable* in its ſublimer parts. For theſe and other reaſons it cannot admit of an *adequate definition*. And who, in the beginning of his reſearches, ſhould preſume to define that which, after all his longeſt and beſt conducted labours, he can only hope partially, and often imperfectly, to comprehend; and of which an important part can neither be *directly* expreſſed nor *directly* underſtood? We may indeed eſteem ourſelves highly favoured by the Author and finiſher of all truth, if, at the end of our reſearches, we ſhall be able any way to underſtand, to define, and to apply a few particular portions and detachments of it, and to guard them from ERROR and corruption. When upon a ſolemn occaſion the queſtion was put to our Lord by a Roman governor, *What is TRUTH?* though it was what he fully and perfectly knew, and what he came purpoſely and profeſſedly to teach, he did not define it. He knew that definition was never the beſt method of inſtruction; and that in its common uſe and application it was ſeldom the friend of truth. Philoſophically viewed, words do not conſtitute truth; they are only the vocal inſtruments by which it is communicated, or the written ſigns by which it is recorded. By an inquirer, therefore, things are to be examined rather than words defined. By a teacher, things are to be conveyed by words in ſome form or other, which are doubtleſs to be explained to the underſtanding if not ſufficiently underſtood before. But *explanation* is one thing, and *definition* quite another. Explanation is the *firſt* office of a teacher: Definition, if it be good, is the *laſt* of the inquirer, after the truth be found; and is then the moſt *advantageouſly* employed by the teacher, when his previous inſtructions have prepared him for it. GOD is a mind, and TRUTH is conſequently an *attribute* of MIND. To the SUN, declaring at his riſing a marvellous inſtrument, He, by whom all things were made, hath delegated the power of enlightening the *material* ſyſtem; whilſt he hath reſerved to HIMSELF the office which is more ſuitable to his nature, of giving light and knowledge, by his eternal TRUTH, to the *mind* of man. But whether he act through the inſtrumentality of his creatures, or more *immediately* from himſelf, he is uniform and conſiſtent in his operations; ſo that one part of his divine economy is always illuſtrative of another. As the SUN ſheds his *light* over the material creation to be apprehended by the eye, TRUTH is the *light* ſhed down from heaven to be apprehended by the intellect, given to illumine every ſubject, natural and moral, corporeal and ſpiritual, ſo far as they are qualified by their different natures to convey to the human mind, or rather perhaps ſo far as the human mind is qualified to receive it from them." *The Chart and Scale of Truth*, vol. I.

This paſſage, of which ſome parts are certainly not remarkable for perſpicuity, ſeems to be deſcriptive, not of *truth* in the common acceptation of the word, but of *all knowledge* human and divine, of which indeed no adequate definition can be given. *Truth*, as here uſed, ſeems to be oppoſed to *ignorance*; as uſed by Mr Wollaſton and others it is oppoſite to *falſehood*. In this laſt ſenſe it may certainly be *explained*; if not defined: and if the learned lecturer will allow that Mr Wollaſton has given a good *explanation* of the word *truth* as oppoſed to *falſehood*, we ſhall not quarrel with him or any man about the propriety of an expreſſion. We have called it a *definition* of truth; becauſe it was ſo called by the author from whom it is taken.

(x) Dr Beattie, in his elegant eſſay, has given a definition of truth very different from this, though it is poſſible that his meaning may be the ſame with Mr Wollaſton's. "I account that to be *truth* (ſays he) which the conſtitution of our nature determines us to believe; and that to be *falſehood* which the conſtitution of our nature determines us to diſbelieve." But if truth be really *immutable*, as he teaches or wiſhes to teach, it muſt depend upon the nature of things, and not upon the inſtinctive impulſe of any particular conſtitution. It is always difficult, often impoſſible, to diſtinguiſh between the conſtitution of our nature, as it came from the hand of God, and the ſame conſtitution as it is moulded by arbitrary and capricious aſſociations of our own. A ſincere member of the Church of Rome, certainly believes the doctrine of tranſubſtantiation. How he may do ſo we have already ſhown. Were all mankind ſincere members of that church, it would be ſaid

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Of Truth.

which can be expreſſed or apprehended is neceſſarily either true or falſe, whether its truth or falſehood be perceived or not either by him who hears or by him who utters it. All propoſitions are either affirmative or negative; but before any thing can with certainty be affirmed or denied of another, we muſt know thoſe things as they are in themſelves, as well as the eſtabliſhed uſe of the ſigns by which they are expreſſed. He who affirms or denies without this knowledge, ſpeaks at random, and has no diſtinct meaning.

122 Every human faculty concerned in the acquiſition of truth.

Every faculty which we poſſeſs is in ſome way or other an inſtrument of knowledge; for we know by our ſenſes, by our memory, and by our intellect. Every one of our faculties, therefore, is concerned in the acquiſition of truth, and furniſhes the mind with the materials of propoſitions. Theſe propoſitions are indeed of various knds; but they are all certainly true or certainly falſe, though the *certainty* of the truth or falſehood of every one it is not always in our power to perceive.

123 Diverſity of belief affects not the truth of what is believed.

When a man affirms that red is a quality inherent in a ſoldier's coat, he utters a propoſition which every one of the vulgar firmly believes to be true, but which every philoſopher knows to be falſe. This diverſity of belief, however, affects not the truth of the propoſition itſelf. All mankind know that it is either true or falſe, independent of them or their perceptions; and it is eaſy, by a few optical experiments and by an explanation of terms to convince them all, that what they have agreed to call *red* is no quality inherent in external objects, but only a ſenſation cauſed by the impulſe of certain rays of light reflected from certain objects to the eye of the percipient. The contrariety therefore in this caſe of vulgar to philoſophical belief, does not reſult from any ambiguity in the nature of truth itſelf, but from the different means of perception which the clown and philoſopher poſſeſs.

Again, were a man looking at a red and a green object, to affirm that they are both of the ſame colour, he would affirm what in one ſenſe may be true, what in another is undoubtedly falſe, and what in a third may be either true or falſe. If it be his meaning that the two objects give to him the ſame ſenſation, he may know with the utmoſt certainty that what he ſays is true; if he mean that they affect all mankind preciſely as they affect him, he utters what all mankind with the moſt abſolute certainty know to be falſe; if he mean that the texture of the two bodies (that particular diſpoſition of parts on their ſurfaces which makes them reflect certain rays of light and abſorb others) is exactly ſimilar, ſo as that the one muſt reflect the very ſame kind of rays with the other, he utters what all mankind muſt *believe* to be falſe, though ſtill it is *poſſible* that what he affirms may be true. This diverſity of belief affects not the truth itſelf. The two objects are what they are by whomſoever perceived, or whether perceived or not; the rays of light reflected by each are what they are, whether they fall upon this, upon that, or upon any eye; and the ſenſation communicated to this ſingular man is certainly what he is conſcious it is, as thoſe of the reſt of mankind are with equal certainty what they are conſcious of. This being the caſe, it is obvious and undeniable, that the organs of ſight in this individual and the human race are ſomehow differently formed from thoſe of each other: and the only queſtion which can occaſion a doubt in the mind of the ſceptic is, whether his or their eyes be ſo formed as to repreſent things truly? But that by the one or the other things are truly repreſented, is as evident as that two contradictory propoſitions cannot both be true. Now, though, for any thing we know it is certainly poſſible, as to us it appears not to imply any contradiction, that the eyes of but one man are formed in a manner ſuitable to their objects, whilſt the eyes of all other men are formed to deceive them; yet the contrary is ſo highly probable, that no man really doubts of it any more than he doubts whether three and two be equal to five.

124 Why ſome truths are ſaid to be abſolutely and others morally certain.

This laſt propoſition is indeed ſaid to expreſs a truth abſolutely certain, whilſt the former expreſſes a truth which is called morally certain: not that there is any real difference or degrees of certainty in the nature of truths themſelves; the only difference is in our power of perceiving them. That three and two are equal to five, is ſaid to be an abſolute truth; becauſe we perceive the whole of it as it is in itſelf, and are convinced that every intelligence from the higheſt to the loweſt who underſtands the terms in which it is expreſſed perceives it as we do: whereas of *moral* or *phyſical* truths, as they are called, we only perceive a part, and may therefore miſtake for want of evidence. Thus, in the caſe of the two objects exhibiting the ſame colour to one man, whilſt they exhibit different colours to all other men, could we ſee into the objects themſelves and comprehend them immediately with our intellect as we comprehend our own ideas, it might, and no doubt would, appear as palpable a contradiction to ſay that the particular diſpoſition of the parts on their ſurfaces, which reflect the rays of light, are the ſame in both, as it is now to affirm that three and two are not equal to five. Between truth and falſehood there is no medium. All truths are in *themſelves* equally certain; and to the Supreme Being, who knows the nature of every thing more fully and intimately than we know our own ideas, they all *appear* equally certain: but yet we may without abſurdity ſpeak of *probable* truth as well as of *certain* truth, provided always that we make the difference to reſult, not from the nature of things, but from the power of our underſtanding, which comprehends the one kind of truth wholly and the other only partially.

125 Why ſome truths are ſaid to be eternal and neceſſary, whilſt others are conſidered as temporary and contingent.

There is another diviſion made of truth into that which is eternal and neceſſary, and that which is temporary and contingent. Though we do not approve

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and thought, "that the conſtitution of human nature determines men to believe tranſubſtantiation:" a doctrine which, though it is rejected by millions, Pere Buffier has laboured hard to reconcile with common ſenſe. Yet it is certain that the ſame body cannot be in different places at the ſame time; and that therefore tranſubſtantiation muſt be falſe, though believed by all mankind. Our *believing* any thing does not make it true, nor our *diſbelieving* any thing make it falſe. We muſt, indeed, *act* according to our belief; but in every inſtance truth and falſehood would have been what they are, though we had never exiſted.

of applying the epithets *temporary* and *eternal* to any thing but real exiſtences, yet as this manner of ſpeaking has been uſed by all philoſophers, we ſhall give inſtances of each kind of truth, and endeavour to aſcertain in what the diſtinction conſiſts. "The three angles of a plain triangle are equal to two right angles," is a propoſition expreſſive of a neceſſary and eternal truth. "The world exiſts," is a contingent and temporary truth. Here it is obvious, that if both theſe propoſitions be true, there is no diſtinction between them, ſo far as mere *truth* is concerned; for truth admits not of degrees of compariſon. It is however ſaid, that the firſt propoſition depends not upon time, or will, or any thing elſe; and that the Supreme Being himſelf could not make it falſe: whereas it is certainly poſſible, that he who created the world could annihilate it, and thus reduce what is now a truth to an abſolute falſehood. This difference between the two propoſitions is thought a ſufficient ground for calling the former a *neceſſary* and *eternal* truth, and the latter a *temporary* and *contingent* truth. But is the difference itſelf real? In the preſent inſtance we cannot think that it is: for if the right angles and triangles, which conſtitute the materials of the former propoſition, be real corporeal things, they may be annihilated as well as the reſt of the world; and then the truth of the propoſition will ceaſe, for there can be neither equality nor inequality between nonentities. If the angles and triangles be merely ideas in the mind of a rational being, it is not to be denied that the propoſition muſt be true, independent of all *will*, whenever thoſe ideas exiſt, *i. e.* whenever right angles and triangles are *thought upon*; but if all reaſonable creatures were to be annihilated, and the Supreme Being never to think of triangles, the propoſition would unqueſtionably ceaſe to be either true or falſe. The world indeed may be annihilated; but it certainly is not annihilated whilſt any one creature exiſts to contemplate even that which is called *neceſſary* and *eternal* truth: and therefore whilſt any truth exiſts in a mind not divine, it muſt be neceſſarily true that the world exiſts; for the individual being by which truth is perceived would then conſtitute the whole world.

But if in a ſomewhat different manner we compare the former of theſe propoſitions with this—"The ſolar ſyſtem conſiſts of the ſun and at leaſt ſeven primary planets"—we ſhall at once perceive the difference between neceſſary and contingent truths. Both propoſitions we know to be true at this moment: but there is this difference between them, that a plain triangle can neither actually exiſt at any period of duration, nor be conceived by any one mind divine or human, of which the three internal angles are not preciſely equal to two right angles; whereas the ſolar ſyſtem may eaſily be conceived, and might certainly have been formed, with a ſmaller number of primary planets rolling round the central fire. This needs no proof; as it is well known, that till very lately we conceived the ſyſtem to conſiſt of the ſun and only ſix primary planets; and it has been already ſhown, that whatever we can poſitively conceive may poſſibly exiſt. Thus, then, every propoſition of which the contrary is clearly and diſtinctly perceived to be impoſſible, is a *neceſſary* truth; and it may likewiſe be ſaid to be *eternal*, becauſe at every period of duration it muſt of neceſſity when thought upon be perceived to be true: On the other hand, every propoſition of which the contrary may be clearly and diſtinctly conceived, is, if true, only a *contingent* truth, becauſe its contrary might have exiſted; and it may likewiſe be called *temporary*, becauſe what might have been falſe in time paſt may yet be falſe in time future.

126 Truth perceived by our rational faculties, which are commonly ſaid to be two, reaſon and judgement.

Though all our faculties (our ſenſes, our memory, and our intellect) furniſh materials for propoſitions, and are therefore all ſubſervient to the inveſtigation of truth; yet the perception of truth, as it is in itſelf, is commonly aſcribed to our rational faculties; and theſe have by Locke and others been reduced to two—reaſon and judgment. The former is ſaid to be converſant about certain truths, the latter chiefly about probabilities.

127 To which ſome philoſophers have added a third faculty, viz. common ſenſe.

Some late philoſophers of great merit, diſſatisfied with this analyſis of the intellect, have added to reaſon and judgment a third faculty, to which they have given the name of *common ſenſe*, and of which the proper object is ſuch truths as neither admit nor ſtand in need of evidence. By *common ſenſe* they mean, "that degree of judgment which is common to men with whom we can converſe and tranſact buſineſs." Whether the introduction of ſuch a term into metaphyſics was proper or improper, we do not think it of importance to enquire. According to this definition of it, which is Dr Reid's, it differs not from the *reaſon* (x) and *judgment* of Locke; agreeing with the former when its

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(x) This is expreſsly acknowledged by Dr Reid. "It is abſurd (ſays that able and candid writer) to conceive that there can be any oppoſition between reaſon and common ſenſe. It is indeed the firſt-born of reaſon; and as they are commonly joined together in ſpeech and in writing, *they are inſeparable in their nature*. We aſcribe to reaſon two offices or two degrees: The firſt is to judge of things ſelf-evident; the ſecond to draw concluſions that are not ſelf-evident from thoſe that are. The firſt of theſe is the province, and the ſole province, of common ſenſe; and therefore it *coincides with reaſon in its whole extent*, and is only *another name* for one branch or one degree of reaſon." Pere Buffier talks nearly the ſame language; but Dr Beattie expreſſes himſelf very differently. "That there is a real and eſſential difference between theſe two faculties; that common ſenſe cannot be accounted for by being called the *perfection of reaſon*, nor reaſon by being reſolved into *common ſenſe*; will appear (he thinks) from the following remarks. 1. We are conſcious, from internal feeling, that the energy of underſtanding, which perceives intuitive truth, is different from that other energy which unites a concluſion with a firſt principle by a gradual chain of intermediate relations. 2. We cannot diſcern any neceſſary connection between reaſon and common ſenſe." Nay, he ſays, "That we often find men endued with the one who are deſtitute of the other:" and he inſtances dreams and certain kinds of madneſs where this is the caſe; adding, that a man who believes himſelf

Of Intuitive evidence and Demonſtration.

its object is certain truth, and with the latter when it is converſant about probabilities. Nothing indeed is more evident, than that in the aſſent of the mind to every propoſition, ſome energy of the judgment is exerted; and upon every propoſition not ſelf-evident, reaſoning of ſome kind or other muſt be employed to procure that aſſent. Inſtead therefore of perplexing ourſelves and our readers with various analyſes of the human underſtanding, or rather with various names to what after all is perhaps but one individual power, it will ſurely be of more importance to the cauſe of truth to examine the different ſources of evidence by which the aſſent of the reaſon, or judgment, or common ſenſe is determined.

Under the article Logic it was obſerved, that *intuition*, *experience*, and *teſtimony*, are each a ſufficient *ground* of *judgment;* but they are not the only grounds. *Conſciouſneſs* is certainly one ſource of evidence, perhaps the moſt complete of any; and in a low degree, *analogy* is another. Of *conſciouſneſs* we have already treated, but of *analogy* we have yet ſaid nothing: and though we might (for an account of *intuition*, *experience*, and *teſtimony*) refer our readers to the article Logic, where they are accurately though conciſely explained, we ſhall, without repeating what has been already ſaid, add a few words on each, as well to complete the preſent article as to ſupply the deficiencies of the former.

Sect. II. *Of Intuitive Evidence and Demonſtration.*

128 Intuitive evidence, what.

Intuitive evidence is that which ariſes from the compariſon of two or more ideas or notions when their agreement or diſagreement is perceived immediately, without the intervention of any third idea or notion. Of this kind is the evidence of theſe propoſitions: One and four make five[*]; things equal to "the ſame thing are equal to one another; the whole is greater than any of its parts;" and in a word, all the axioms in arithmetic and geometry. All theſe are in reality propoſitions in which the ſubject and predicate appear upon compariſon to be nothing more than the ſame thing taken in different views or expreſſed by different terms. In fact, they are all in ſome reſpect reducible to this axiom, "Whatever is, is." We do not ſay that they are deduced from it; for they have in themſelves that original and intrinſic evidence which makes them, as ſoon as the terms are underſtood, to be perceived intuitively. And if they be not thus perceived, no deduction of reaſon will ever confer on them any additional evidence. But though not deduced from the general axiom, they may be conſidered as particular exemplifications of it; inaſmuch as they are all implied in this, that the properties and relations of our clear and adequate ideas can be no other than what the mind clearly perceives them to be.

129 Every demonſtration a ſeries of propoſitions intuitively evident.

It may perhaps be thought, that if axioms were propoſitions perfectly identical, it would be impoſſible by their means to advance a ſingle ſtep beyond the ſimple ideas firſt perceived by the mind. And it would indeed be true, that if the predicate of the propoſition were nothing but a repetition of the ſubject under the ſame aſpect, and in the ſame or ſynonymous terms, no conceivable advantage could be made of it for the furtherance of knowledge. Of ſuch propoſitions as theſe, for inſtance, "ſeven are ſeven, eight are eight, the three angles of a triangle are the three angles of a triangle, two right angles are two right angles," it is manifeſt that we could never avail ourſelves for the improvement of ſcience: But when the thing, though in effect coinciding, is conſidered under a different aſpect; when that which is ſingle in the ſubject is divided in the predicate, and converſely; or when what is a whole in the one is regarded as a part of ſomething elſe in the other; ſuch propoſitions lead to the diſcovery of innumerable and apparently remote relations. It is by the aid of ſuch ſimple and elementary principles that the arithmetician and the algebraiſt proceed to the moſt aſtoniſhing diſcoveries. Nor are the operations of the geometrician eſſentially different: for to this claſs belong all propoſitions relating to number and quantity; that is, all which admit of mathematical demonſtration. If the truth of a mathematical propoſition be not ſelf-evident; in other words, if the ſubject and predicate do not appear at firſt ſight to be different names for the ſame thing, another term muſt be found that ſhall be ſynonymous to them both. Thus, to prove that the three internal angles of a right-lined triangle are equal to two right angles, I produce the baſe of the triangle; and by a very ſhort proceſs I diſcover that the exterior angle ſo formed is equal to the two interior and oppoſite angles. By a proceſs equally plain and ſhort, I perceive that the exterior angle and the interior adjacent angle are equal to two right angles: But I have already ſeen, that the exterior angle is neither more nor leſs than the two interior and oppoſite angles under a different aſpect; whence it appears that the three internal angles of the triangle are nothing elſe than two right angles under a different aſpect. In a word, all demonſtration is founded on firſt principles or primary truths, which

[*] Campbell's Philoſophy of Rhetoric.

ſelf made of glaſs, ſhall yet reaſon very juſtly concerning the means of preſerving his ſuppoſed brittleneſs from flaws and fractures." Surely theſe are ſtrange remarks. Dreams and madneſs have hitherto been ſuppoſed to originate in the imagination, or as it was denominated by the ancient philoſophers, the *phantaſia:* and when the ideas or forms which are there treaſured up are diſarranged or abſurdly compounded, a dreaming ſane man or a waking madman, if he reaſon at all, muſt reaſon from abſurd principles; not, however, through any defect of common ſenſe, but from a diſorder in that region of the brain, upon which the phantaſia more immediately depends. Of his firſt remark, we can only ſay, that to us it appears to be the reverſe of truth. In every propoſition which admits of demonſtration, *we* are conſcious that the concluſon is united with the firſt principle by a repetition of the very ſame energy of the underſtanding which perceives intuitive truth. That this is the caſe in every one of Euclid's demonſtrations, we appeal to every mathematical reader; and why it muſt be ſo, we ſhall by and by endeavour to evince.

neither admit nor ſtand in need of proof, and to which the mind is compelled to give its aſſent by a bare intuition of the ideas or terms of which theſe primary truths are compoſed. Nothing is ſuſceptible of demonſtration, in the rigid ſenſe of the word, but general, neceſſary, and eternal truths; and every demonſtration is built upon intuition, and conſiſts in a ſeries of axioms or propoſitions of the very ſame kind with the firſt principle or truth from which the reaſoning proceeds. That propoſitions formerly demonſtrated are taken into the ſeries, doth not in the leaſt invalidate this account; inaſmuch as theſe propoſitions are all reſolvable into axioms, and are admitted as links in the chain; not becauſe neceſſary, but merely to avoid the uſeleſs prolixity which frequent and tedious repetitions of proofs formerly given would occaſion. But it is obvious that ſuch truths only as reſult from the compariſon of ideas and notions are neceſſary; and of courſe that ſuch truths only are capable of ſtrict demonſtration. The truths which relate to real exiſtences are all contingent, except that which affirms the exiſtence of the Supreme Being, the Parent of all truth.

The mathematical ſciences, categorical logic, and that part of metaphyſics which demonſtrates the being of God, are therefore the only branches of human knowledge which admit of ſtrict demonſtration. The longeſt demonſtration in the mathematical ſciences may be traced to this general and neceſſary truth, "Whatever is, is," or to ſome particular exemplification of it: the longeſt train of categorical ſyllogiſms terminates in this general principle, "What is affirmed or denied of a whole *genus*, may be affirmed or denied of all the *ſpecies* and all the *individuals* belonging to that genus:" and the metaphyſical demonſtration of the being of God reſts upon this foundation, "Whatever had a beginning, had a cauſe." That theſe are truths abſolutely certain, which can neither be proved nor called in queſtion, every man may be ſatisfied, merely by attending to the ideas or notions which the terms of each propoſition expreſs. The two firſt are merely identical propoſitions, of the truth of which no man has ever pretended to doubt; and though the laſt is not identical, it is a neceſſary and ſelf-evident truth, as its contrary implies, that in the ſame thing there is power and no power, change and no change, action and inaction, at the ſame inſtant.

130
It is by intuition that we acquire all our notions of relation.

Before we diſmiſs the ſubject of intuition, it may not be improper to obſerve, that it is by this faculty or power of the mind contemplating its ideas, and comparing one idea with another, that we acquire all our notions of relation; ſuch as *identity* and *diverſity*, *reſemblance*, *coexiſtence*, relations of *ſpace* and *time*, relations of *quantity* and *number*, of a *cauſe* to its *effect*, and many more which it would be uſeleſs as well as tedious to enumerate.

SECT. III. *Of Experience and Analogy.*

131
Experience, the reſult of repeated obſervations.

It has been juſt obſerved, that intuition and demonſtration are applicable only to general and neceſſary propoſitions, of which the contrary are not only falſe, but abſurd and impoſſible. The great buſineſs of life, however, is with facts and contingent truths, which admit not of demonſtration, but reſt upon other evidence. The ſenſes, external and internal, are the inlets to all our knowledge of facts; and the memory is the ſtorehouſe where that knowledge is preſerved. Of what a man ſees or feels, he can at the inſtant of ſeeing or feeling entertain no doubt; and whilſt the ideas of what he has ſeen or felt, with all their aſſociated circumſtances, remain vivid and diſtinct in his memory, he is conſcious that he poſſeſſes ſo much real knowledge. But all our knowledge, as it is derived from the ſenſes, is of particular facts or particular truths; and the man who has in certain circumſtances obſerved one particular phenomenon, for the exiſtence of which he perceives no *neceſſity*, has not ſufficient ground to conclude, that in ſimilar circumſtances ſimilar phenomena will always occur. Milton, who ſurpaſſed the greater part of his contemporaries in philoſophical ſcience almoſt as far as he has ſurpaſſed all ſucceeding poets in the ſublimity of his genius, repreſents Adam, when firſt falling aſleep, as under apprehenſions that he was about to ſink into his original ſtate of inſenſibility:

> ————————"Gentle ſleep
> "Firſt found me, and with ſoft oppreſſion ſeiz'd
> "My drowſed ſenſe, untroubled; though I thought
> "I then was paſſing to my former ſtate
> "Inſenſible, and forthwith to diſſolve."

Apprehenſions ſimilar to theſe would take place in his mind when he firſt perceived that darkneſs had overſpread the earth. In his circumſtances, he could have no ground to expect that the ſun when once ſet would riſe again to relume the world, as he had not then experienced the alternate ſucceſſion of light and darkneſs, and probably knew not whence light proceeds. After ſome time, however, having obſerved day and night regularly to ſucceed each other, theſe two appearances, or the ideas of them, would be ſo aſſociated in his mind, that each ſetting ſun would ſuggeſt the idea of next ſun-riſing, and lead him to expect that glorious event with the utmoſt confidence. He would then conſider the alternate ſucceſſion of day and night as a law of nature, which might be affirmed in a propoſition expreſſive of a certain truth.

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Is the only evidence that we have for all the general truths in phyſics, even thoſe which we think intuitively certain.

This continued obſervation of the ſame event happening in the ſame or ſimilar circumſtances, is what we call *experience;* and it is the only evidence which we have for all the general truths in phyſics, even for thoſe which we are apt to think intuitively certain *. Thus, that *milk* is white, and that *gold* is yellow, are ſuppoſed to be univerſal and neceſſary truths: but for any thing that we know, they may be particular truths; and they are certainly contingent, as the contrary to either of them may be ſuppoſed without abſurdity. We have indeed always obſerved the milk of animals of every ſpecies *white;* and therefore the idea of *white* becomes a neceſſary part of our *idea* of the ſubſtance milk, of which we call whiteneſs an eſſential property. This, however, reſpects only the milk of thoſe animals with which we are acquainted. But ſince the milk of all the animals with which we are acquainted, or of which we have heard, is white, we can have no reaſon to ſuſpect that the milk of any new and ſtrange animal is of any other colour. Alſo, ſince, wherever there has been the ſpecific gravity, ductility, and other properties of *gold*, the colour has always been *yellow;* we conclude that theſe circumſtances are neceſſarily united, though by ſome unknown bond of union, and that they will always go together.

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* Campbell's Philoſophy of Rhetoric; and Prieſtley's Remarks on the Drs Reid, &c.

133
Difference between experience and analogy.

The proper proof, therefore, of ſuch univerſal propoſitions as "that milk is white," "that gold is yellow," or "that a certain degree of cold will freeze water," conſiſts in what is called an induction of *particular facts* of preciſely the ſame nature. Having found, by much and various experience, that the ſame events never fail to take place in the ſame circumſtances, the *expectation* of the ſame conſequences from the ſame previous circumſtances is neceſſarily generated in our minds; and we can have no more ſuſpicion of a different event than we can ſeparate the *idea* of *whiteneſs* from that of the other properties of *milk*.—When the previous circumſtances are preciſely the ſame, we call the proceſs of proof by the name of *induction*, and expect the event from *experience*: but if they be not preciſely the ſame, but only bear a conſiderable reſemblance to the circumſtances from which any particular appearance has been found to reſult, we call the argument *analogy*; and it is ſtronger in proportion to the degree of reſemblance in the previous circumſtances. Thus the milk of all the cows that we have ſeen, or upon which we have made the experiment, having been found nouriſhing, we confidently expect that the milk of all other cows will prove nouriſhing likewiſe; and this confidence of expectation is the reſult of uniform experience. But if, from having found the milk of all the animals with which we are acquainted to be nouriſhing, however different the nature of theſe animals; we infer that the milk of any ſtrange animal will likewiſe be nouriſhing; the inference is drawn by analogy, and by no means carries with it the conviction of experience. A proof from *real* experience can leave no doubt in the mind (B); an argument from analogy always muſt. In the one caſe, we only infer that two events of preciſely the ſame nature and in preciſely the ſame circumſtances have been produced by the ſame kind of cauſe; in the other, we infer that two events ſimilar in moſt reſpects, though for any thing that we know diſſimilar in others, have been produced by the ſame kind of cauſe; and it is obvious that between theſe caſes the difference is great.

134
The evidence of analogy inferior to that of experience.

Thus, after having obſerved that all the projectiles to which we have paid any attention—a ſtone thrown from the hand, a ball from a gun, and an arrow from a bow—deſcribe a certain curve, and are impelled in that curve by two powers acting in different lines of direction which form with each other a certain angle, we infer that all projectiles which on the ſurface of the earth deſcribe the ſame curve are impelled by the ſame or ſimilar powers acting in the ſame or ſimilar lines of direction. This inference is the reſult of experience, and carries with it the fulleſt conviction to the mind. But when, from having obſerved that the curves deſcribed by the planets are of the ſame kind with thoſe deſcribed by projectiles on the earth, Sir Iſaac Newton inferred that theſe vaſt bodies are impelled in their orbits by forces of the very ſame kind, and acting in the ſame manner with the forces which impel a ball from a cannon or an arrow from a bow, his argument was founded only on analogy; and even that analogy is very remote. We know by experience that all projectiles which fall under our immediate cogniſance are of the very ſame kind and in the very ſame circumſtances; that every one of them has a tendency, from whatever cauſe, to the centre of the earth, and is preſerved from falling by the force of projection; we know likewiſe that they are all moved thro' the medium of the atmoſphere, which at the ſurface of the earth is conſiderably denſe, and that a denſe medium muſt occaſion much reſiſtance: But we do not *know* that the planets have a tendency to the centre of the ſun, that they are preſerved from falling into that luminary by a projectile force, or whether they move through a *medium* or *in vacuo*: ſo that we are not *certain* that the motion of the planets is perfectly ſimilar to that of terreſtrial projectiles in any other circumſtance than the form of the curve which they all deſcribe; and from this ſingle caſe of coincidence no inference can be drawn which carries to the mind abſolute conviction.

When a man reaſons from *experience*, he infers, that what has uniformly happened hitherto, will happen always in the very ſame circumſtances; or that what is known to be the cauſe of *various phenomena of the ſame kind* is the cauſe of every other phenomenon in *all reſpects* ſimilar to theſe. Such an inference is founded on the united and complete evidence of ſenſe, memory, and reaſon. When a man reaſons from *analogy*, he infers, that what has *generally* happened hitherto, will

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(B) We ſay from *real* experience; becauſe what is often taken for *experience*, and to human eyes has that appearance, is in fact nothing more than *analogy*. Thus a phyſician may have preſcribed to ninety-nine patients labouring under the ſame diſeaſe the ſame remedy, and always with the ſame ſucceſs. If ſo, he will think that he has experience of its utility, and will preſcribe it again with the fulleſt confidence. Yet in this caſe he may be diſappointed; for though the medicine be the ſame and the diſeaſe the ſame, there may be ſomething in the conſtitution of the hundredth patient ſo different from that of the ninety-nine, that what was ſalutary to them may be pernicious to him. This does not detract from the evidence of experience: it only ſhows, that the circumſtances of the caſe in which the medicine failed were different from thoſe in which it ſucceeded. In ſuch concluſions as are founded on a complete induction and uniform experience, every man expects the event with the laſt degree of aſſurance, and regards his paſt experience as a full *proof* of the future exiſtence of that event: In other caſes, where experience has been variable—or apparently variable—he knows that the induction has been incomplete, and therefore proceeds with caution. He weighs the oppoſite experiments; takes as complete a view as he can of the circumſtances in which they were made; conſiders which ſide is ſupported by the greater number of experiments, and inclines to that ſide with doubt and heſitation. And when at laſt he fixes his judgment, the evidence exceeds not what is called *probability*. All probability, then, ſuppoſes an oppoſition of experiments and obſervations, where the one ſide is found to overbalance the other, and to produce a degree of evidence proportioned to the ſuperiority will happen again in circumſtances *nearly ſimilar*; or that what is known to be the cauſe of various phenomena of the ſame kind, is the cauſe of other phenomena in *ſome reſpects* ſimilar to theſe. This inference is likewiſe founded on the united evidence of ſenſe, memory, and reaſon: but here the evidence of ſenſe is not complete, and it can be ſtrengthened only by finding more facts of the ſame or of a ſimilar nature.

Sect. IV. *Of Teſtimony.*

135
Mankind ready to believe the teſtimony of each other.

The laſt ſource of evidence which we propoſed to conſider is *teſtimony*, or the report of men concerning events which have fallen under the obſervation of their ſenſes. That we are all ready to believe the information which we receive from the teſtimony of our fellow creatures is undeniable; and indeed without ſuch belief, every man's knowledge of facts and events would be confined to thoſe only of which he himſelf had been a perſonal witneſs. In that caſe, no man who had not travelled would believe that there are ſuch cities as Rome and Conſtantinople; and no man whatever could now believe that ſuch heroes as Hannibal and Cæſar had ever exiſted.

Between words and things there is no natural connection; and though we are all accuſtomed to give to things the names by which they are known in the language that we ſpeak, and to expreſs their mutual relations by the words appropriated for that purpoſe; yet it is obviouſly impoſſible to denote one thing by the name of another, and to expreſs by words relations that have no exiſtence. This being the caſe, it may be aſked upon what principle we give credit to human teſtimony? To this queſtion various anſwers have been given, which have produced much controverſy on one of the moſt important ſubjects which can employ the mind of man.

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The reaſon aſſigned by Hume for this propenſity
* Eſſay on Miracles.

"We may obſerve (ſays Mr Hume*), that there is no ſpecies of reaſoning more common, more uſeful, and even neceſſary to human life, than that which is derived from the teſtimony of men and the reports of eye-witneſſes and ſpectators. The ſpecies of reaſoning perhaps one may deny to be founded on the relation of cauſe and effect. I ſhall not diſpute about a word. It will be ſufficient to obſerve, that our aſſurance in any argument of this kind is derived from no other principle than our obſervation of the veracity of human teſtimony, and of the uſual conformity of facts to the reports of witneſſes. It being a general maxim that no (A) objects have any diſcoverable connection together and that all the inferences which we can draw from one to another are founded merely on our experience of their conſtant and regular conjunction; it is evident that we ought not to make an exception to this maxim in favour of human teſtimony, whoſe connection with any event ſeems in itſelf as little neceſſary as any other. Were not the memory tenacious to a certain degree; had not men commonly an inclination to truth, and a principle of probity; were they not ſenſible to ſhame when detected in falſehood: Were not theſe, I ſay, diſcovered by *experience* to be qualities inherent in human nature, we ſhould never repoſe the leaſt confidence in human teſtimony. And as the evidence derived from witneſſes and human teſtimony is founded on paſt experience, ſo it varies with the experience, and is regarded either as a *proof* or *probability*, according as the conjunction between any particular kind of report and any kind of object has been found to be conſtant or variable. There are a number of circumſtances to be taken into conſideration in all judgments of this kind; and the ultimate ſtandard by which we determine all diſputes that may ariſe concerning them, is always derived from experience and obſervation. The reaſon why we place any credit in witneſſes and hiſtorians, is not derived from any *connection* which we perceive *à priori* between teſtimony and reality, but becauſe we are accuſtomed to find a conformity between them. But when the fact atteſted is ſuch a one as has ſeldom fallen under our obſervation, here is a conteſt of two oppoſite experiences; of which the one deſtroys the other as far as it goes, and the ſuperior can only operate on the mind by the force which remains. The very ſame principle of experience which gives us a certain degree of aſſurance in the teſtimony of witneſſes, gives us alſo, in this caſe, another degree of aſſurance againſt the fact which they endeavour to eſtabliſh; from which contradiction there neceſſarily ariſes a counterpoiſe, and mutual deſtruction of belief and authority."

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confuted, and.
§ Diſſertation on Miracles, and The Philoſophy of Rhetoric.

This account of the origin of faith in teſtimony has been controverted with much ſucceſs by the Doctors Campbell and Reid. "That the evidence of teſtimony is derived ſolely from experience (ſays the former of theſe writers §), is at leaſt not ſo inconteſtable a truth as Mr Hume ſuppoſes it; that, on the contrary, teſtimony hath a natural and original influence on belief antecedent to experience, will, I imagine, eaſily be conceived. For this purpoſe, let it be remarked, that the earlieſt aſſent which is given to teſtimony by children, and which is previous to all experience, is, in fact, the moſt unlimited; that by a gradual experience of mankind, it is gradually contracted, and reduced to narrower bounds. To ſay, therefore, that our diffidence in teſtimony is the reſult of experience, is more philoſophical, becauſe more conſonant to truth, than to ſay that our faith in teſtimony has this foundation. Accordingly, youth, which is unexperienced, is credulous; age, on the contrary, is diſtruſtful. Exactly the reverſe would be the caſe were this author's doctrine juſt." This is a complete confutation of the reaſoning of Mr Hume: but in order to prevent all cavilling, it is to be wiſhed that the very acute author had explained more fully what he means by ſaying, that teſtimony hath a *natural* and *original* influence on belief; for theſe words may be taken in different ſenſes, in one of which what he affirms is true, and in another falſe.

Dr

(A) Is there then no diſcoverable connection between a tree and the field in which it grows; between a man and his cloaths; between an author and his work; between a ſceptic and paradoxes? Surely all theſe are correlaries, and neceſſarily ſuggeſt the ideas of each other.

Of Teſtimony.

§ Inquiry into the Human Mind, &c.

Dr Campbell's omiſſion is amply ſupplied by Dr Reid, who gives § the following account of teſtimony, and of the credit which it obtains. "The wiſe and beneficent Author of nature, who intended that we ſhould be ſocial creatures, and that we ſhould receive the greateſt and moſt important part of our knowledge by the information of others, hath, for theſe purpoſes, implanted in our nature two principles that tally with each other. The firſt of theſe principles is a propenſity to ſpeak truth, and to uſe the ſigns of language ſo as to convey our real ſentiments. This principle has a powerful operation even in the greateſt liars; for where they lie once, they ſpeak truth a hundred times. Truth is always uppermoſt, and is the natural iſſue of the mind. It requires no art or training, no inducement or temptation, but only that we yield to a natural impulſe. Lying, on the contrary, is doing violence to our nature, and is never practiſed even by the worſt men without ſome temptation. Speaking truth is like uſing our natural food, which we would do from appetite, although it anſwered no end; but lying is like taking phyſic, which is nauſeous to the taſte, and which no man takes but for ſome end which he cannot otherwiſe attain.—When we are influenced by any motive, we muſt be conſcious of that influence, and capable of perceiving it upon reflection. Now, when I reflect upon my actions moſt attentively, I am not conſcious that in ſpeaking truth I am influenced on ordinary occaſions by any motive moral or political. I find that truth is always at the door of my lips, and goes forth ſpontaneouſly if not held back. It requires neither good nor bad intention to bring it forth, but only that I be artleſs and undeſigning. There may indeed be temptations to falſehood, which would be too ſtrong for the natural principle of veracity, unaided by principles of honour or virtue; but where there is no ſuch temptation, we ſpeak truth by *inſtinct*. By this inſtinct, a real connection is formed between our words and our thoughts; and thereby the former become fit to be ſigns of the latter, which they could not otherwiſe be."

Such is the account which Dr Reid gives of the truth of human teſtimony: and he adds, that there is another original principle implanted in us by the Supreme Being, to tally with it, viz. a diſpoſition to confide in the veracity of others, and to believe what they tell us. "This (he ſays) is the counterpart to the former; and as that may be called the *principle of veracity*, we ſhall, for the want of a more proper name, call this the *principle of credulity*. It is unlimited in children, until they meet with inſtances of deceit and falſehood; and retains a very conſiderable degree of ſtrength through life."

It is ever with extreme reluctance that we controvert the opinions of this able writer; and that reluctance cannot be leſſened in the preſent inſtance, when we are conſcious that great part of what he ſays is unanſwerable. That truth is always at the door of the lips; that it requires no effort to bring it forth; that in ordinary caſes men ſpeak truth uninfluenced by any motive moral or political; that the greateſt liars ſpeak truth a hundred times where they lie once; and that lying is never practiſed by the worſt men without ſome temptation, are poſitions which daily experience renders it impoſſible to queſtion: But notwithſtanding this, we do not think that truth is ſpoken by an *inſtinctive* principle; becauſe it is inconceivable that inſtinct ſhould teach the uſe of arbitrary and artificial ſigns, ſuch as the words of every language undoubtedly are; or that between ſuch ſigns and ideas any *inſtinctive* connection ſhould ever be formed. "Truth (as we have defined it) is the conformity of thoſe words or ſigns by which things are expreſſed, to the things themſelves;" and things themſelves are what they are, independent of us, our inſtincts, and perceptions. When we have preciſe and adequate ideas of objects, and when thoſe ideas are related to one another as the objects themſelves are related, we are in poſſeſſion of mental truth; and in this caſe there is a *real* and *natural* connection between the ſigns and the things ſignified: for we cannot frame original and ſimple ideas which have no archetype in nature; nor can *one* object, diſtinctly perceived, generate in our minds the ideas that are generated by *other* objects. Here external things are the objects, and ideas are the ſigns, which, when they are in conformity to the things ſignified by them, conſtitute truth.

138 The true reaſon aſſigned.

But in human teſtimony, the ideas in the mind of the ſpeaker are the things ſignified, and the words of language are ſigns by which they are expreſſed; and when theſe things and ſigns are in conformity to each other, the words uttered expreſs ſo much truth.—Now, though in this caſe there is no *natural* connection between the ſign and the thing ſignified, yet it is obvious, that without a violent effort of the ſpeaker to the contrary they muſt always be in conformity with each other: becauſe, in every language, there are words appropriated for the purpoſe of denoting every idea and relation which can be expreſſed; and in the mind of every man theſe ideas, relations, and *words*, have been conſtantly aſſociated from the time that he learned to ſpeak. So intimate is this aſſociation, and ſo impoſſible to be broken, that whoever will pay ſufficient attention to the operations of his own mind, will find that he *thinks*, as well as *ſpeaks* in ſome language; and that in cogitation he ſuppoſes and runs over, ſilently and habitually, thoſe ſounds which in ſpeaking he actually utters (B). If this be ſo, it is impoſſible that a man without ſome effort ſhould ever ſpeak any thing but truth: for the *ideas* of what he has ſeen or heard, &c. are not of his manufacture;

(B) This ſeems to have been *Plato's* opinion; for he calls *thinking* λογον ον ἀυτη προς αυτην ἡ ψυχη δι ἐξερχεται, περι ὡν αν σκοπῃ, "the language by which the ſoul explains itſelf to itſelf when it conſiders any thing." And *Plotinus* ſays, Ο εν φωνῃ λογος μιμημα του εν ψυχῃ, "the vocal words are an imitation of thoſe of the ſoul." To ſay that vocal words are an imitation of thoſe of the ſoul, is to ſpeak inaccurately, and to reverſe the proceſs of aſſociation; but it affords ſufficient evidence, that in the opinion of Plotinus men think as well as ſpeak in words.

Of Teſti-mony.

nufacture; they are generated by external objects: and till they be effaced from the memory, they muſt always, by the law of aſſociation, make their appearance there with all their mutual relations, and in their proper dreſs. In the very act of learning to ſpeak, we neceſſarily learn to ſpeak the *truth:* for were we not to employ words exactly as they are employed by thoſe with whom we converſe, our language (if language it might be called) would be unintelligible; and we could neither declare our wants nor aſk relief with any hopes of ſucceſs. *Children* beginning to ſpeak, may indeed utter untruths without any motive, and merely from miſtake; becauſe the ideas and words of children have neither been long nor cloſely aſſociated: but it is impoſſible that a *man*, however wicked, ſhould habitually and without motives lie on ordinary occaſions, unleſs the fundamental principles of his nature have been totally altered; unleſs his brain has been diſordered by diſeaſe; unleſs his ideas have been diſarranged, and all his original aſſociations broken.

We know indeed by woful experience, that immoral men occaſionally utter falſehoods with a view to deceive. But on theſe occaſions they are influenced by ſome motive either of hope or terror: the falſehood is always uttered with an effort: and ſo ſtrong is the aſſociation between words and ideas, that the truth will at times break out in ſpite of all their endeavours to ſuppreſs it; ſo that the end or middle of a falſe narrative, if it be of any length, is commonly inconſiſtent with the beginning. We entertain a ſuſpicion concerning any matter of fact, when thoſe who relate it contradict each other—when they are but few in number, or of doubtful character—when they have an intereſt in what they affirm—when they deliver their teſtimony with heſitation—or, on the contrary, with too violent aſſeverations; becauſe theſe are circumſtances which we have generally experienced to accompany falſe witneſs. It is likewiſe with reluctance that we admit a narrative of events entirely different from every thing which hitherto we have ſeen or heard; becauſe we may not be certain that the narrator is not under ſome influence to deceive us in matters concerning which we have nothing but his teſtimony on which to ground our judgment. But in every caſe where the fact recorded is in itſelf poſſible, and attributed to an adequate cauſe; where a competent (c) number of witneſſes had ſufficient means of information, and are certainly under no inducement to deceive; teſtimony is complete evidence, however extraordinary the fact may be; becauſe no fact which is known to have an adequate cauſe can be ſo incredible, as that a number of men of ſound underſtandings ſhould act contrary to the fundamental principles of human nature, or be able, if ſo diſpoſed, to diſſolve aſſociations which had been formed in the mind of each from his infancy, and form new ones, all agreeing exactly with one another, but all contrary to truth.

PART II. OF BODY WITH ITS ADJUNCTS.

CHAP. I. *Of the* COMPOSITION *of* BODIES; *or, of* MATTER *and* FORM.

HITHERTO we have contemplated only the powers of our own minds by which we acquire a ſtock of ideas, and the various operations of the intellect upon thoſe ideas, as treaſured up in the memory or imagination. In the courſe of the inquiry we have found, that every idea and notion which we have was ſuggeſted by ſomething independent of us; and in order to diſcover what thoſe things are, we have inveſtigated the nature of each ſenſe, as it is by the ſenſes only that we have any communication with the external world. By touch we perceive heat and cold, hardneſs and ſoftneſs, figure, ſolidity, motion, and extenſion; by the organ of ſmell, we perceive odours; by the tongue and palate, taſtes; by the ear, ſounds; and by the ſight, colours. We have likewiſe ſeen, that heat and cold, odours, taſtes, ſounds, and colours, are mere ſenſations which have no exiſtence but while they are perceived. On the other hand, hardneſs and ſoftneſs, figure and ſolidity, motion and extenſion, are neither ſenſations, nor like ſenſations; but are conceived to be ſomething external and independent of us, and to be the cauſes of certain ſenſations. Even of heat and cold, odours, taſtes, ſounds, and colours, we know with certainty that there is ſome cauſe independent of our faculties, which may operate in a deſart wilderneſs as well as in a populous city, though, for want of ſentient beings to operate upon, it cannot in the wilderneſs produce the ſame effects as in the city.

139 Of things perceived by the ſenſes the greater part always united.

Of things perceived by the ſenſes we find the greater part always united; for when a man perceives a piece of ſealing-wax, if he makes uſe of all his ſenſes, he perceives at once cold, taſte, colour, hardneſs, roughneſs or ſmoothneſs, figure, ſolidity, motion or reſt, and extenſion. That the powers or qualities, which in this inſtance produce the ſenſations of heat or cold, taſte, odour, and colour, are ſo united to the hardneſs, figure, ſolidity, and extenſion of the wax, as that they cannot exiſt alone, is evident; becauſe it is impoſſible to remove any one of theſe things, or to conceive it removed, without removing with it all the reſt. What then is the bond of this union? Do theſe things neceſſarily accompany one another, ſo as that one of them cannot exiſt without bringing all the reſt along with it? No; there is no neceſſary connection among them: for by the operation of fire the wax may be rendered liquid, when the *hardneſs* and *cold* are gone, tho' every thing elſe remains the ſame, or nearly the ſame, as it was before. By a ſtill further operation of fire the appearance may be entirely changed; and that which was formerly a piece of hard red wax, may be reduced to ſmoke and aſhes, in which there is neither hardneſs, colour, odour, nor figure; at leaſt there is not in the ſmoke and aſhes *ſuch* hardneſs, colour, odour, or figure, as was in the wax. The ſolidity and extenſion, however, remain; for we perceive aſhes and ſmoke, to be extended and ſolid as much as wax or an adamant; nor is it poſſible to do any thing with the wax, or with any other ſenſible object, which ſhall deprive it of extenſion or ſolidity.

(c) Should it be aſked what number we call competent, we beg leave to ſay, that it will be greater or leſs according to circumſtances. In caſes where they are not liable to the deceptions of ſenſe, two men of integrity and intelligence deſerve equal credit with two thouſand; but where there is particular occaſion for good organs, whether of ſight, hearing, or touch, the greater the number the greater is our ſecurity. To this muſt be added, that as one man is influenced by that which to another would be no motive, a great number of witneſſes concurring in the ſame teſtimony is always an additional ſecurity that they are not under the influence of any latent bias.

140 Some of theſe things termed accidents, and why.

Thus, then, extenſion and ſolidity may exiſt and be perceived when ſeparated from hardneſs, colour, and odour; but none of theſe can exiſt, or be conceived to exiſt, independent of extenſion and ſolidity. Hardneſs, colour, odour, taſte, and figure, or the things which ſuggeſt theſe notions to us, have with great propriety been termed accidents or qualities; becauſe they cannot exiſt or be conceived to exiſt by themſelves, but require for their ſupport one common ſubject. Extenſion and ſolidity can exiſt independent of them, but they cannot exiſt independent of ſolidity and extenſion.

141 Things perceived by the ſenſes, qualities which inhere in a ſubject called matter.

Is then ſolidity the baſis of theſe qualities, ſo that they neceſſarily reſult from it? No; there are many things ſolid and extended which are neither hard, nor coloured, nor odorous, nor ſapid; which could not be if theſe qualities were the neceſſary effect of ſolidity. Beſides, all mankind conceive of ſolidity and extenſion as qualities of ſomething elſe; for we never ſay that ſolidity is extended or coloured, or hard or odorous, but that ſomething ſolid has theſe qualities: whence it is evident that we conſider ſolidity as a quality itſelf. In what then does ſolidity and all the other ſenſible qualities inhere, ſince they cannot exiſt ſeparately and do not ſupport each other? This is a queſtion which modern philoſophers pretend not to anſwer: but ſome of the ancients were not ſo modeſt. Ariſtotle and his followers reſolved every bodily ſubſtance into *matter* and *form*, making matter the baſis or *ſubſtratum*, and under form comprehending all ſenſible qualities.

As attempts have been lately made to revive this philoſophy, it may not be improper to give a ſhort view of the doctrine of *matter* and *form*, if it were only to diſcover whether the ſpeculations of Ariſtotle and his adherents on this ſubject deſerve to be prefered to thoſe of Newton and Locke.

The moſt perſpicuous, and by far the moſt elegant writer among the moderns who has adopted the ancient philoſophy, is Mr Harris; and leſt we ſhould be accuſed by others of doing injuſtice to a ſubject above the reach of ordinary comprehenſion, we ſhall tranſcribe ſo much of what he has ſaid of *matter* and *form* in his philoſophical arrangements as ſeems neceſſary to make our readers underſtand his meaning as far as it is intelligible.

142 The Peripatetic doctrine concerning matter;

"Matter (ſays this writer) is that elementary conſtituent in compoſite ſubſtances which appertains in *common* to them all, without diſtinguiſhing them from one another. Every thing generated or made, whether by nature or art, is generated or made out of ſomething elſe; and this ſomething elſe is called its ſubject or matter. Such is iron to the ſaw; ſuch is timber to the boat. Now this *ſubject* or *matter* of a thing being *neceſſarily previous* to that thing's exiſtence, is *neceſſarily different* from it, and *not the ſame*. Thus iron, as iron, is not a ſaw; and timber, as timber, is not a boat. Hence, then, one character of every *ſubject* or *matter*, that is, the character of *negation* or *privation*. [He means *negation* or privation of what is to be made out of it.]

143 Which is deſcribed as deſtitute of every attribute or quality,

"Again, though the *ſubject* or *matter* of a thing be not that thing, *yet*, were it incapable of becoming ſo, it could not be called its ſubject or matter. Thus iron is the *ſubject* or *matter* of a ſaw; becauſe, though *not* a ſaw, it may ſtill *become* a ſaw. On the contrary, timber *is not* the ſubject or matter of a ſaw; becauſe it not only (as timber) is no ſaw, but can never be made one from its very nature and properties. Hence, then, beſides *privation* another character of every *ſubject* or *matter*, and that is the character of *aptitude* or *capacity*. [He means aptitude or capacity to be that which is made out of it.]

"Again, when one thing is the *ſubject* or *matter* of *many* things, it implies a *privation* of them *all*, and a *capacity* to them *all*. Thus iron being the ſubject or matter of the ſaw, the axe, and the chiſſel, implies *privation* and *capacity* with reſpect to *all three*. Again, we can change a ſaw into a chiſſel, but not into a boat; we can change a boat into a box, but not into a ſaw. The reaſon is, there can be no change or mutation of one thing into another where the two changing beings do not participate the ſame matter (D). But even here, were the boat to moulder and turn to earth, and that earth by natural proceſs to metalliſe and become iron; through ſuch progreſſion as this we might ſuppoſe even the boat to become a ſaw. Hence therefore it is, that *all change* is by immediate or mediate participation of the *ſame matter*. Having advanced thus far, we muſt be careful to remember, firſt, that every *ſubject* or *matter* implies, as ſuch, *privation* and *capacity*; and next, that *all change* or *mutation* of beings into one another is *by means of their participating the ſame common matter*. This we have choſen to illuſtrate from works of art, as falling more eaſily under human cogniſance and obſervation. It is, however, no leſs certain as to the productions of nature, though the ſuperior ſubtlety in theſe renders examples more difficult. The queſtion then is, whether in the world which we inhabit, it be not admitted from experience, as well as from the confeſſion of all philoſophers, that ſubſtances

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(D) In a note he ſays: This reaſoning has reference to what the ancients called υλη προσεχης, *the immediate matter*, in oppoſition to υλη πρωτη, *the remote* or *primary matter*.

ſubſtances of every kind (E), whether natural or artificial, either immediately or mediately, paſs into one another; and whether, in that caſe, there muſt not be ſome one *primary matter* common to *all things*. I ſay ſome *one primary matter*, and that common to *all things*, ſince without ſome *ſuch* matter *ſuch mutation* would be wholly impoſſible. But if there be ſome *one primary matter*, and that *common to all things*, this *matter* muſt imply, not (as particular and ſubordinate matters do) a *particular* privation and a *particular* capacity, but, on the contrary, *univerſal* privation and *univerſal* capacity. If the notion of ſuch a being appear ſtrange and incomprehenſible, we may farther prove the *neceſſity* of its exiſtence from the following conſiderations: Either there is no ſuch general change as here ſpoken of; which is contrary to fact, and would deſtroy the ſympathy and congeniality of things: Or, if there be, there muſt be a matter of the character *here* eſtabliſhed; becauſe without it (as we have ſaid) ſuch change would be *impoſſible*. Add to this, however hard *univerſal* privation may appear, yet had the *primary matter*, in its proper nature, any one particular attribute, ſo as to prevent its *privation* from being unlimited and univerſal, ſuch *attribute would run through all things*, and be conſpicuous in all. If it were white, all things would be white; if circular, they would be circular; and ſo as to other attributes; which is contrary to fact. Add to this, that the *oppoſite* to ſuch attribute could *never* have exiſtence, unleſs it were poſſible for the ſame thing to be at *once* and in the ſame inſtance both white and black, circular and rectilineal, &c. ſince this inſeparable attribute would neceſſarily be *every where;* becauſe the *matter*, which implies it, is itſelf *every where*, at leaſt may be found in all things that are generated and periſhable.

144 And to be apprehended only by abſtraction and analogy.

"Here then we have an idea (ſuch as it is) of that ſingular being υλη πρωτη, the *primary matter;* a being which thoſe philoſophers who are immerged in ſenſible objects know not well how to admit, though they cannot well do without it; a being which flies the perception of every *ſenſe*, and which is at beſt, even to the *intellect*, but a negative object, no otherwiſe *comprehenſible* than either by *analogy* or *abſtraction*. We gain a glimpſe of it by *abſtraction*, when we ſay that the *firſt matter* is *not* the lineaments and complexion which make the beautiful face; *nor yet* the *fleſh* and *blood* which make thoſe lineaments and that complexion; *nor yet* the liquid and ſolid aliments which make that fleſh and blood; *nor yet* the ſimple bodies of earth and water which make theſe various aliments; but *ſomething*, which being *below* all theſe, and ſupporting them all, is yet *different* from them all, and eſſential to their exiſtence. We obtain a ſight of it by *analogy*, when we ſay, that as is the braſs to the ſtatue, the marble to the pillar, the timber to the ſhip, or any one *ſecondary matter* to any one *peculiar form;* ſo is the *firſt* and *original matter* to all *forms in general*."

Such is the doctrine of the Peripatetics concerning the *primary matter*, or the baſis of bodily ſubſtances. We forbear to make any remarks upon it till we have ſeen what they ſay of *form*, the other eſſential part of every body; for what is meant by *matter* and *form* will be moſt completely ſeen when they are viewed together.

145 The peripatetic doctrine concerning form.

"Form (ſays the ſame elegant writer) *is that elementary conſtituent in every compoſite ſubſtance, by which it is* DISTINGUISHED, *and* CHARACTERISED, *and known, from every other*. But to be more explicit: The *firſt* and moſt ſimple of all *extenſions* is a *line:* this, when it exiſts, united with a *ſecond* extenſion, makes a *ſuperficies;* and theſe two, exiſting together with a *third*, make a *ſolid*. Now this *laſt* and *complete* EXTENSION we call the *firſt* and *ſimpleſt* FORM; and when this *firſt* and *ſimpleſt form* accedes to the *firſt* and *ſimpleſt matter*, the union of the two produces *body;* which is for that reaſon defined to be *matter triply extended*. And thus we behold the riſe of *pure* and original *body* (F). It muſt be remembered, however, that *body*, under this character, is ſomething *indefinite and vague*, and ſcarcely to be made an *object* of *ſcientific contemplation*. It is neceſſary to this end that its extenſion ſhould be *bounded;* for as yet we have treated it without ſuch regard. Now, the *bound* or *limit* of *ſimple body* is *figure;* and thus it is that *figure*, with regard to *body*, becomes the next *form* after *extenſion*.

146 The three original forms which added to matter, conſtitute body phyſical.

"But though the *boundary* of body by *figure* is one ſtep towards rendering it *definite* and *knowable*, yet is not this ſufficient for the purpoſes of nature. It is neceſſary *here*, that not only its *external* ſhould be duly bounded, but that a ſuitable regard ſhould likewiſe be had to its *internal*. This *internal adjuſtment*, diſpoſition, or *arrangement* (denominate it as you pleaſe), is called ORGANIZATION, and may be conſidered as the *third* form which appertains to body. By its acceſſion we behold the riſe of BODY PHYSICAL OR NATURAL; for every ſuch body is ſome way or other *organized*. And thus may we affirm, that theſe *three*, that is to ſay, *extenſion*, *figure*, and *organization*, are the *three original forms* to *body phyſical* or *natural;* *figure* having reſpect to its *external*, *organization* to its *internal*, and *extenſion* being common both to one and to the other. It is more than probable, that from the variation in theſe *univerſal* and (as I may ſay) *primary forms*, ariſe moſt of thoſe *ſecondary* forms uſually called *qualities ſenſible*, becauſe they are the proper objects of our ſeveral ſenſations. Such are roughneſs and ſmoothneſs, hardneſs and ſoftneſs; the tribes of colours, ſavours, odours; not to mention thoſe powers of character more *ſubtle*, the powers electric, magnetic (G), medicinal, &c.

"Here

(E) He muſt mean only bodily ſubſtances; for it is not admitted by ſuch philoſophers as make a diſtinction between mind and body, that the one ever paſſes into the other.

(F) "Original body (he ſays), when we look *downward*, has reference to the *primary matter*, its ſubſtratum: when we look *upwards*, it becomes itſelf a *matter* to *other things;* to the *elements*, as commonly called, air, earth, water, &c. and in conſequence to all the variety of *natural productions*."

(G) That it is from the *extenſion*, *figure*, and *organization* of bodies, that their *medicinal* powers ariſe, ſeems to be undeniable; for medicines operate by contact: but it is not ſo clear that the ſame *forms*, to uſe the author's language, are the ſource of *magnetical* powers. If the magnet be ſurrounded with an atmoſphere extending to a certain diſtance, ſuch may be the caſe; but if not, the author's conjecture muſt be ill founded. See MAGNETISM.

Of the Compoſition of Bodies.

" Here therefore we may anſwer the queſtion, how *natural* bodies are *diſtinguiſhed*. Not a ſingle one among them conſiſts of *materials in chaos*, but of materials wrought up after the moſt exquiſite manner, and that conſpicuous in their *organization*, or in their *figure*, or in *both*.—As therefore every *natural body* is diſtinguiſhed by the *differences* juſt deſcribed, and as theſe *differences* have nothing to do with the *original matter*, which being every where ſimilar can afford no diſtinction at all; may we not here infer the expediency of ESSENTIAL FORMS, that every *natural ſubſtance* may be eſſentially *characteriſed?* Theſe *forms*, though they differ from matter, can yet *never ſubſiſt without it;* but *united* with it, they help to produce every *compoſite* being, that is to ſay, in other words, every *natural ſubſtance*, in the viſible world. It muſt be remembered, however, that it is the FORM in this union which is the *ſource of all diſtinction*. It is by *this* that the *ox* is diſtinguiſhed from the *horſe*, not by that graſs on which they ſubſiſt, the *common matter* to both. To which alſo may be added, that as figures and ſenſible qualities are *the only objects of our ſenſations*, and theſe are all *parts* of *natural form;* ſo therefore (contrary to the ſentiment of the vulgar, who dream of nothing but of matter) *it is form, which is in truth the whole that we either hear, ſee, or feel;* nor is *mere matter* any thing better than an *obſcure imperfect being*, knowable only to the *reaſoning faculty* by the two methods already explained, I mean that of *analogy* and that of *abſtraction*. Here therefore we conclude with reſpect to *ſenſible forms*, that is to ſay, *forms immerged in matter* and *ever inſeparable* from it. In *theſe* and *matter* we place the ELEMENTS OF NATURAL SUBSTANCE."

If this extract appear long, let it be remembered that it contains the fulleſt and moſt perſpicuous detail which is to be found in the Engliſh language, of a doctrine of which the author of *Ancient Metaphyſics* ſuppoſes Locke to have been ignorant; and for which ignorance he affects to treat the Engliſh philoſopher with ſupercilious contempt. Had Locke really been ignorant of the ancient doctrine of *matter* and *form*, it is probable that moſt people will be of opinion that the *contempt* expreſſed by his cenſurer might have been ſpared; but if it ſhould appear, that, as far as this theory is intelligible, it differs not, except in words, from the doctrine laid down in the *Eſſay concerning human underſtanding*, what ſhall we think of that zeal for ancient phraſes, which had influence ſufficient to make one reſpectable philoſopher pour contempt upon another who was an ornament to his country?

147 Matter cannot be deſtitute of ſolidity.

What Mr Harris has ſaid of *matter* and *form* reſpecting works of art, is ſufficiently intelligible, and extremely juſt. Nor ſhould we object to the account which he gives of the origin of natural body, if he had not diveſted his firſt matter of every power and every quality, ſolidity and extenſion not excepted. But though we can ſuppoſe body diveſted of any one particular figure and of every ſenſible quality, ſuch as colour, odour, taſtes, &c. and the *ſubſtratum* or *baſis* or *matter* of it ſtill to remain, yet it ſeems impoſſible to conceive it diveſted of *ſolidity* without ſuppoſing it totally annihilated. Nay, if we have any juſt notion at all of ſolidity, it is evidently inſeparable from the ſubſtratum of body, whatever that ſubſtratum be; and indeed, though Mr Harris diveſts his firſt matter of every attribute, the argument by which he proves the neceſſary exiſtence of ſuch a being does not require its privation to be ſo univerſal. " Had the *primary matter* (ſays he), in its proper nature, any one particular attribute, ſo as to prevent its privation from being unlimitted and univerſal, *ſuch attribute would run through all things* and be conſpicuous in all." This indeed is obvious and undeniable: but *ſolidity* and *extenſion* do in *fact* run through *all things* into which the *ſubſtratum* or *matter* of body is ever formed or ever can be conceived to be formed; and therefore there is no neceſſity for ſuppoſing the firſt matter diveſted of theſe attributes (H).

Mr Harris ſays, that both Timæus and Plato drop ex-

(H) Nor does it appear that it was diveſted of them by all the ancient philoſophers. We learn from Cudworth, that " the atomical phyſiology, the moſt ancient perhaps of any, teaches that body is nothing elſe but διαστατον αντιτυπον, *extended bulk;* and that nothing is to be attributed to it but what is included in the nature and idea of it, viz. greater or leſs magnitude with diviſibility into parts, figure, and poſition, together with motion or reſt, but ſo as that no part of body can ever move itſelf. And conſequently, this philoſophy ſuppoſes, that there is no need of any thing elſe beſides the ſimple elements of magnitude, figure, ſite, and motion (which are all clearly intelligible, or different modes of extended ſubſtance), to ſolve the corporeal phenomena by; and therefore not of any ſubſtantial *forms* diſtinct from the matter; nor of any other qualities really exiſting in the bodies without, beſides the reſults or aggregates of thoſe ſimple elements, and the diſpoſition of the inſenſible parts of bodies in reſpect of figure, ſite, and motion; nor of any intentional *ſpecies* or *ſhews* propagated from the objects to our ſenſes; nor, laſtly, of any other kind of motion or action really diſtinct from local motion (ſuch as generation and alteration), they being neither intelligible as modes of extended ſubſtance, nor any way neceſſary: Foraſmuch as the forms and qualities of bodies may well be conceived to be nothing but the reſult of thoſe ſimple elements of magnitude, figure, ſite, and motion, variouſly compounded together; in the ſame manner as ſyllables and words in great variety reſult from the different combinations and conjunctions of a few letters, or the ſimple elements of ſpeech; and the corporeal part of ſenſation, and particularly that of viſion, may be ſolved only by local motion of bodies; that is, either by corporeal effluvia (called *ſimulacra membranæ* and *exuviæ*), ſtreaming continually from the ſurface of the objects, or rather, as the later and more refined atomiſts conceived, by preſſure made from the object to the eye, by means of light in the medium. So that ως δια βακτηριας του ταθεντος αερος το αντερειδον αγγελλεται, the ſenſe taking cognizance of the object by the ſubtile interpoſed medium, that is tenſe and ſtretched (thruſting every way from it upon the optic nerves), doth by that, as it were by a ſtaff, touch it. Again, generation and corruption may be ſufficiently explained by concretion and ſecretion, or local motion, without ſubſtantial forms and qualities.

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expreſſions as if they conſidered *matter* to be *place;* but place, as will be ſeen afterwards, can be the baſis of nothing. He likewiſe quotes a paſſage from Ammonius on the predicaments, in which it is ſaid "that there never was in *actuality* either matter without body, or body without quality;" and we appeal to our readers if it be not abſolutely impoſſible to contemplate ſuch a being even in *idea*. To the queſtion, Whether the firſt matter has a ſeparate exiſtence by itſelf, diſtinct from all the qualities of body, the author of *Ancient Metaphyſics* anſwers thus:——"We have no idea of its exiſting ſeparately, becauſe we find no ſuch thing in nature, from which we draw all our ideas; but whether there may not be ſuch a thing exiſting in the regions of infinite ſpace, as *matter* without *form* and *dimenſions*, is what I think no man can take upon him to decide." But with all ſubmiſſion, if a man cannot decide this queſtion with the utmoſt certainty, his three ponderous volumes are nothing better than waſte paper: for the ſubject of them is things *exiſting*; and concerning exiſtence we know nothing with greater certainty than that a being of which nothing poſitive can be affirmed, cannot poſſibly have any exiſtence.

148 Some firſt matter common to all bodies.

That, in the world which we inhabit, bodily ſubſtances of every kind, whether natural or artificial, either immediately or mediately paſs into one another, is a truth which cannot be denied; and therefore it follows, that there muſt be ſome one primary matter common to all things. In modern philoſophy this primary matter is conſidered as ſolid, and as the *ſubſtratum* of all bodies; and all thoſe things which, in the language of Mr Harris, are comprehended under the appellation of *form*, are called *qualities:* ſo that on this ſubject the ancient and modern philoſophy differ in nothing but in the latter uſing the word *qualities* inſtead of the word *form;* and defining the firſt matter to be a "*ſolid* ſubſtance every where the ſame," whilſt the ancient philoſophy conſiders it as void of ſolidity.

149 Of the nature of which all men are equally ignorant.

Of the nature of this firſt matter all philoſophers are equally ignorant: for, as Mr Harris ſays, it is in truth *form;* or, as modern philoſophers would ſay, they are in truth *qualities*, which are the whole that we either hear, or ſee, or feel, or of which we have either idea or conception. Mr Locke ſays expreſsly, "That if any one will examine himſelf concerning his notion of pure ſubſtance in general, he will find that he has no other idea of it at all, but only a ſuppoſition of he knows not what ſupport of ſuch qualities as are capable of producing ſimple ideas in us."

150 How we know that the things immediately perceived are qualities,

But how, it has been aſked, do we know that the things which we perceive are qualities, and cannot exiſt without a ſubject? We anſwer, Becauſe every one of them, except ſolidity, may be changed or deſtroyed, and the ſubject in which they inhere ſtill remain. Thus, though wax may be melted or burnt, and be no longer a hard red ſubſtance of ſuch a figure and ſuch a ſmell, the matter which ſupported the hardneſs, figure, colour, and ſmell ſtill remains; for melted wax or aſhes is as much a ſolid ſubſtance as is that which may be uſed for the ſealing of letters, &c.

It has been ſaid that ſolidity (1) is the *ſubſtratum* of

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lities. And laſtly, thoſe ſenſible ideas of light and colours, heat and cold, ſweet and bitter, as they are diſtinct things from the figure, ſite, and motion of the inſenſible parts of bodies, ſeem plainly to be nothing elſe but our own fancies, paſſions, and ſenſations, however they be vulgarly miſtaken for qualities in the bodies without us." *Cudworth's Intellectual Syſtem*, Book i. chap. 1.

This, as will be ſeen by and by, is the philoſophy of Newton, Locke, and all their followers: and that it is the genuine philoſophy of the ancient atomiſts, we may ſafely take the word of the author whom we have quoted: for no modern has been more converſant with their writings, more completely maſter of their language, or has given their ſenſe with greater accuracy. Thoſe authors, therefore, who in their zeal for ancient metaphyſics would explode the phyſiology of Newton and Locke, and ſubſtitute in its place the Ariſtotelian doctrine of *matter* and *form*, refute their own pretences; for the theory which they would baniſh is more ancient than that which they wiſh to introduce; and we appeal to our readers if it be not more intelligible.

(1) The philoſophers of moſt eminence who have maintained this opinion are, *Dr Watts*; the author of the *Procedure, Extent, and Limits of the Human Underſtanding*; and *Dr Law* late biſhop of Carliſle, who in a note upon *King's origin of evil* gives the opinion of the triumvirate in the following words:——"We find by experience, that a thing will always exhibit the ſame appearances in ſome reſpects, though it admit of changes in others: or, in Mr Locke's language, that certain numbers of ſimple ideas go conſtantly together, whereas ſome others do not. The former of theſe we call the *ſubſtance*, thing, or being, itſelf; the latter are termed its modes or *accidents*. Thus the ſubſtance of *body*, as far as we know of it, conſiſts in ſolidity and extenſion; which being neceſſarily finite, it alſo becomes capable of diviſion, figure, and motion. Theſe are its original inſeparable qualities, which conſtitute the thing, and ſeem not to depend on any thing elſe as a *ſubject*. But a particular figure, motion, &c. are only accidents or modes of its exiſtence; which do not neceſſarily attend it, though they themſelves cannot be ſuppoſed to exiſt without it. The ſubſtance of *ſpirit* conſiſts in the powers of thinking and acting, which likewiſe admit of various modifications. This ſeems to be all that we can learn concerning the nature of things from obſervation and experience. To inquire into the *manner* how theſe, which we call *properties*, exiſt together, or to attempt to explain the *cauſe*, ground, or reaſon, of their union, is in vain. To invent the word *ſubſtance* for a repreſentation of it, is ſaying nothing: it is ſetting a mere word for what we have neither any idea of nor occaſion for. Indeed if we conſider theſe primary qualities as needing ſomething to inhere in, we are obliged to ſeek for ſomething to ſupport them: and by the ſame way of reaſoning, we muſt ſeek for ſomething elſe to ſupport that other ſomething, and ſo on; and at laſt ſhall find no other ſupport for the whole but the cauſe which produced it." "Dr Watts (continues the biſhop) is of opinion, that it is introducing a needleſs *ſcholaſtic* notion into the real nature of things, and then fancying it to have a real exiſtence;" (*Logic*, p. 12.) The author of the *Procedure, Extent*, &c. affirms, "That as far as we directly know the eſſential properties of any ſubſtance, ſo far as we have a *direct* knowledge of the ſubſtance

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of body; and men have been probably led into this notion from a conviction that ſuch *ſubſtratum*, whatever it be, is and muſt be ſolid; but that ſolidity is only a quality inſeparable from the firſt matter, and not that matter itſelf, muſt be evident from this conſideration, that ſolidity is the ſame in all bodies, and incapable of producing by itſelf any other effect than that of excluding from the place occupied by it every other ſolid ſubſtance. It could not of itſelf be the *ſubſtratum* of colour, taſte, or ſmell, otherwiſe all bodies would be coloured, ſapid, and odorous; and as, according to all our notions of it, it is incapable of any change, it could not by itſelf be ſo modified as to excite in us theſe ſenſations.

151 Our notion of matter relative and obſcure

The things then immediately perceived by us, or of which we have any adequate idea or conception, are only qualities which muſt belong to a ſubject; and all that we know about this ſubject is, that it is that to which ſuch qualities belong. From this it is evident, that our notion of matter, as diſtinguiſhed from its qualities, is a relative § and obſcure notion, and muſt remain obſcure till men have other faculties. In this the philoſopher ſeems to have no advantage above the vulgar: for as they perceive colour, and figure, and motion, by their ſenſes, as well as he does; and as both are equally certain that there is a ſubject of thoſe qualities; ſo the notions which both have of this ſubject are equally obſcure; or, to ſpeak more properly, they have no *poſitive* notion of it all. When a philoſopher calls it the *firſt matter*, a *ſubſtratum* or a *ſubject* of *inheſion*, thoſe learned words convey no meaning but what every man underſtands and expreſſes, by ſaying in common language, that it is a thing extended, ſolid, and moveable.

§ Reid's Eſſays on the Intellectual Powers of Man.

They are therefore *qualities*, or in the language of ancient philoſophy, *forms* alone, about which, in corporeal ſubſtance, we can reaſon with preciſion and certainty; and it is ſufficient for all the purpoſes of life that we have of them an adequate knowledge. For as the *firſt matter* or original *ſubſtratum* of all bodies ſeems to be the ſame, though we know not what it is; and as one body is diſtinguiſhed from another only by its *qualities* or *powers;* a knowledge of the nature of theſe is all that can be neceſſary to direct our conduct with reſpect to the various objects with which we are ſurrounded.

152 Qualities primary and

Qualities thus conſidered in bodies, are, firſt, ſuch as are utterly inſeparable from the body, in what ſtate ſoever it is; ſuch as in all the changes and alterations which it ſuffers, and under all the force which can be employed upon it, it conſtantly keeps. Thus, in the inſtance already given, a ſtick of ſealing-wax may, by the operation of fire, be rendered liquid or reduced to ſmoke and aſhes; and when it has undergone theſe changes, it has loſt many of the ſenſible qualities which it had when a long round ſubſtance fit for the purpoſe of ſealing [illegible] perceptible in [illegible], but every particle of ſmoke and aſhes, is ſtill ſolid and extended, as well as the largeſt or longeſt body; and every ſuch particle has ſtill ſome figure, and is capable of motion or reſt. Again, if a grain of wheat or any other corporeal ſubſtance be divided into two parts, and each part be again divided without end, ſtill the ſmalleſt particle of it will be ſolid, extended, of ſome figure, and capable of further diviſion. *Solidity*, *extenſion*, *diviſibility*, and *motion* or *reſt*, are therefore qualities inſeparable from *body*, and have on that account been with great propriety called its *original* or *primary qualities*.

153 Secondary,

There are other qualities, which in truth are nothing in the bodies themſelves, but powers ariſing from the magnitude, figure, texture, and motion, of their inſenſible parts, to produce in us various ſenſations; ſuch are *colours*, *ſounds*, *taſtes*, and *odours*. Theſe have been denominated *ſecondary qualities;* and to them may be added a third ſort, which are univerſally allowed to be barely *powers*, though they are in fact as much real qualities in the ſubject as thoſe we have juſt mentioned. Thus the power in fire to produce by its primary qualities a new colour or conſiſtency in wax or clay, is as much a quality in the fire as the power which it has to produce in us a new ſenſation of warmth or burning. That *colours*, *taſtes*, *ſounds*, and *odours*, as they are perceived by us are mere ſenſations, has been already proved: and that the powers in the bodies which produce theſe ſenſations are not, like *ſolidity* and *extenſion*, inſeparable from the body to which they may belong, is evident; becauſe a piece of *red* wax may be reduced to *black* aſhes; and becauſe by pounding an almond we may change its clear white colour into a dirty hue, and its pleaſant taſte into one that is oily and rancid; and a ſingle rent through the body of a bell deſtroys its ſound.

The primary qualities of body have a real exiſtence, independent of us and of every other creature. Thus the particular *bulk*, *number*, *figure*, and *motion*, of the *parts* of *fire* or *ſnow* are *really in the fire or ſnow*, whether any man's ſenſes perceive them or not; and therefore theſe may be called *real qualities*, becauſe they really exiſt in the bodies: but *light*, *heat*, *whiteneſs*, or *cold*, (as they are perceived by us), are no more *really in fire or ſnow*, than ſickneſs is in *tartar* or pain in a *ſword*. Take away the ſenſations of them: let not the eyes ſee light or colours, nor the ears hear ſounds; let not the palate taſte nor the noſe ſmell; and all colours, taſtes, odours, and ſounds, as they are ſuch particular ſenſations, vaniſh and ceaſe, and are reduced to their cauſes, *i. e.* to the bulk, figure, and motion of the parts of the body.

154 Bodily qua[illegible]

The qualities then that are in bodies, rightly conſidered, are of three ſorts. 1. The *bulk*, *figure*, *number*, *ſituation*, [illegible]

ſubſtance *itſelf:* and if we had a direct knowledge of *all* the eſſential properties of any ſubſtance, we ſhould have an *adequate* knowledge of that ſubſtance; for ſurely, if there be any meaning in words, the knowing every thing of the eſſential properties of a thing is knowing *ſo much* of its very ſubſtance".

That the ſubſtance of body conſiſts in *ſolidity* and *extenſion*, and nothing more; and that theſe depend not upon any thing elſe as a *ſubject;* cannot be true: for *ſolidity*, in our conception, is nothing but *impenetrability*; but whoever uſes the word *impenetrability*, certainly means that there is *ſomething* impenetrable. That there is ſome real thing or being different from ſolidity and extenſion, which impreſſes us with the notion that it is ſolid and extended, is ſelf-evident to all mankind: if it be not matter, theſe conceptions muſt be communicated

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figure, and *motion*, or *reſt*, of their *ſolid* parts. Of theſe, as they are in themſelves, we have clear and diſtinct notions. We know that they are in the body whether we perceive them or not, and we call them *primary* or *eſſential qualities*. 2. The power that is in any body, by reaſon of its internal texture and inſenſible primary qualities, to operate upon our ſenſes in a peculiar manner, producing in us the different ſenſations of *colours*, *ſounds*, *taſtes*, or *ſmells*, &c. Theſe we have called *ſecondary qualities*, but they are often termed *ſenſible qualities*. 3. The *power* that is in any body, by reaſon of the particular conſtitution of its primary qualities, to make ſuch a *change* in the *bulk*, *figure*, *texture*, and *motion* of *another body*, as to make it operate on our ſenſes differently from what it did before. Thus, the ſun has a power to make wax white, and fire to make lead fluid. Theſe are univerſally called *powers*; but we have no ſuch notions of them as we have of the *primary qualities* of bodies. We know that they exiſt, but we know not what they are. It has indeed been diſcovered, that the ſenſation of ſmell is occaſioned by the effluvia of bodies†; that of ſound, by their vibration. The diſpoſition of bodies to reflect a particular kind of light occaſions the ſenſation of colour; and the operation of the minute parts of bodies upon the nerves of the tongue and palate is the cauſe of taſtes. Very curious diſcoveries have been made of the nature of heat and its manner of operating, and an ample field ſtill remains. We are likewiſe intuitively certain, that body can operate upon body only by impulſe; but how certain impulſes upon certain organs ſhould produce ſenſations in us to which there is nothing ſimilar in the impelling body, is equally unknown to the clown and the philoſopher.

155 The doctrine of the ancient atomiſts reſpecting qualities.

Such is the diſtinction which in modern philoſophy is made between primary and ſecondary qualities; but it is a diſtinction which was likewiſe well known to that ſect of ancient philoſophers who were denominated *atomiſts*. At the head of theſe were Thales and Pythagoras (κ); and we may infer from Ariſtotle, that the ſect comprehended almoſt all the phyſiologiſts who taught before himſelf and Plato: for he ſays*, Δημοκριτος και οι πλειστοι των φυσιολογων ατοπωτατον τι ποιουσι, παντα γαρ τα αισθητα απτα ποιουσι, και εις σχηματα αναγουσι τους χυμους: "Democritus, and *moſt* of the *phyſiologiſts*, fall into a great abſurdity; for they make all ſenſe to be touch, and reſolve ſenſible qualities into the figures of inſenſible atoms." And he adds, that "the former phyſiologiſts (without exception) ſaid not well, that there is no black and white without the ſight, nor bitter and ſweet without the taſte." He elſewhere § tells us, that thoſe philoſophers explained generation and alteration without forms and qualities, by figures and local motion." Δημοκριτος και Λευκιππος ποιησαντες τα σχηματα την αλλοιωσιν και την γενεσιν εκ τουτων ποιουσι, διακρισει μεν και συγκρισει γενεσιν και φθοραν, ταξει δε και θεσει αλλοιωσιν. "Democritus and Leucippus having made figures (or variouſly figured atoms) the firſt principles, make generation and alteration out of theſe; namely, generation together with corruption from the concretion and ſecretion of them, but alteration from the change of their order and poſition." By the atomic phyſiologiſts the name of *quality* was generally applied only to thoſe things which we have called *ſecondary qualities*. The *primary* being conſidered as *eſſential* to *matter*, were ſeldom, if ever, called *qualities*. That the atoms, which they held to be the firſt principles of bodies, were figured, ſolid, extended, and moveable, is apparent, not only from the ſhort view of their ſyſtem which we have given from Cudworth, but likewiſe from the paſſages which we have juſt quoted from Ariſtotle: but the queſtion debated between them and their antagoniſts was, whether thoſe atoms had *ſmell*, *taſte*, and *colour*; or, as it was commonly expreſſed, whether they had *qualities*? Democritus, Leucippus, and the other atomiſts, we ſee, maintained that they had not; and the following account of the doctrine of Protagoras, another philoſopher of that ſchool, ſhows, that on this ſubject at leaſt the ancient advocates for the atomic ſyſtem reaſoned as juſtly as any of the moderns, and much more juſtly than the Peripatetics and Platoniſts by whom they were oppoſed. Plato having in his Theætetus firſt ſaid in general that the philoſophy of Protagoras made all things to conſiſt of a commixture of atoms and local motion, repreſents his doctrine concerning colours in particular, after this manner: "Firſt, as to that which belongs to the ſight, you muſt conceive what is called a white or black colour, not to be any thing abſolutely exiſting either without your eyes or within your eyes; but black and white, and every other colour, is cauſed by different motions made upon the eye, from objects differently modified; ſo that it is nothing either in the agent or patient abſolutely,

† Reid's Eſſays on the Intellectual powers of Man, and Locke's Eſſay, &c.

* Lib. de Senſu et Senſibili, cap. 4.

§ De Generatione et Corruptione, lib i. cap. 2.

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cated to us by the immediate agency of the Deity, which ſeems to have been the real opinion of the Biſhop of Carliſle. But this differs not from the theory of Berkeley, which we ſhall conſider by and by.

(κ) This is denied by Biſhop Warburton, who thinks nothing better ſettled than that Democritus and Leucippus were the authors of the atomic phyſiology. We highly reſpect the learning and ingenuity diſplayed in the Divine Legation of Moſes; but on this point we are convinced that its author is miſtaken. Strabo expreſsly affirms, that Mochus the Phenician was the author of the atomic phyſiology; and Cudworth has proved, by arguments which to us are perfectly ſatisfactory, that Thales and Pythagoras were both atomiſts, and that they derived the doctrine from Phœnicia or Egypt. They did not, indeed, ſpeculate in phyſics, but delivered their doctrines as they had received them from tradition, and they referred all motion to mind as its cauſe. Leucippus and Democritus, we believe, were the firſt ſpeculative atomiſts: but though they refined upon, and perhaps improved, the mere mechanical part of the phyſiology of their maſters, they unhappily dropt the better part of it; and, baniſhing mind from their ſyſtem of the univerſe, they became materialiſts and atheiſts. With the ſober and pious part of philoſophers this brought the atomic theory into diſrepute; and Plato and Ariſtotle, who were theiſts, when they oppoſed that theory, always pointed their arguments againſt Leucippus and Democritus, which is probably what led the learned biſhop to conſider theſe atheiſts as the authors of the atomic phyſiology.

Of the Compoſition of Bodies.

ſolutely, but ſomething which ariſes from between them both (L)." From this paſſage it is plain that Protagoras thought of colours exactly as Mr Locke thought, that they are not *real qualities* exiſting in bodies, but merely ſenſations excited in our minds; and indeed he is preſently after repreſented as having called them τινα εν ημιν φαντασματα, *certain fancies or appearances in us*. But there is in the Theætetus another paſſage, in which a fuller account is given of the atomic philoſophy, to this purpoſe: "The principle upon which all theſe things depend is this, That the whole univerſe (M) is motion of atoms and nothing elſe; which motion is conſidered two ways, and is accordingly called by two names *action* and *paſſion*. From the mutual congreſs, and, as it were, attrition of theſe together, are begotten innumerable offsprings, which, though infinite in number, yet may be reduced to two general heads, *ſenſibles* and *ſenſations*, which are both generated at the ſame time. The *ſenſations* are *ſeeing*, *hearing*, and the like; and the correſponding *ſenſibles* are *colours*, *ſounds*, &c. Wherefore, when the eye and its proper object meet together, both the αισθητον and the αισθησις, the *ſenſible idea* of white and black, and the *ſenſation* of ſeeing, are generated together, neither of which would have been produced if thoſe two had not met. The like is to be conceived of all other *ſenſibles*, as hot and cold, &c. None of theſe are abſolute things in themſelves, or real qualities in external objects; but they are begotten from the mutual congreſs of agent and patient, and that by motion. So that neither the agent has any ſuch thing in it before its congreſs with the patient, nor the patient before its congreſs with the agent. But the agent and patient meeting together, and begetting *ſenſation* and *ſenſibles*, both the object and the ſentient are forthwith made to be ſo and ſo qualified; as when honey is taſted, the ſenſation of taſting, and the quality of ſweetneſs, are begotten together, though the ſenſation be vulgarly attributed to the taſter, and the quality of ſweetneſs to the honey." The concluſion of all which is ſummed up thus, ουδεν ειναι αυτο καθ᾽ αυτο, αλλα τινι αει γιγνεσθαι: "Not one of theſe ſenſible things is any thing abſolutely in the object without, but they are all generated or made relative to the ſentient (N)."

The language of ancient philoſophy was defective in preciſion; terms were uſed vaguely and improperly; ſo that the meaning of the author is often to be collected only from the context. When Protagoras is here made to ſay, that when the agent and patient meet together, both the object and the ſentient are forthwith made to be ſo and ſo *qualified*; as when honey is taſted, the ſenſation of taſting and the *quality* of ſweetneſs are begotten together; it could not be his meaning, that every real change is made in the external object merely by their meeting, but only that the actual ſenſation and the ſenſible idea or quality, are produced at once; juſt as he had ſaid before, that the ſenſible idea of white or black, and the ſenſation of ſeeing, are generated together. If his words be thus interpreted, they expreſs a noble truth; and the whole paſſage ſhows, that the ancient Atomic theory, which differed not from the theory of Des Cartes, Newton, and Locke, being the moſt rational as well as the earlieſt ſyſtem of phyſics with which we have any acquaintance. By diveſting body of *eſſential forms* diſtinct from matter and motion, and by giving to the firſt matter extenſion and ſolidity, it renders the corporeal world intelligible; and accounts for thoſe appearances which are called ſecondary qualities, in a manner perfectly ſatisfactory. Ariſtotle indeed oppoſed the Atomic philoſophy, and had influence enough to bring it into diſrepute for many ages; but when he inſiſted that the two conſtituent principles of body are *matter* and *form*, both independent of all ſentient beings, and which may be conceived as exiſting diſtinct from each other, he ſubſtituted for a ſimple and ſublime theory an abſurd and incomprehenſible fiction.

Of the Eſſences of Bodies.

CHAP. II. *Of the* ESSENCES *of* BODIES.

156 The eſſences of bodies relat,

HAVING treated of the ſubſtance, qualities, and powers of body, we may ſeem to have exhauſted this part of our ſubject; but there is ſtill more to be done. Metaphyſicians, ancient and modern, have introduced another term into the ſcience, to denote that which diſtinguiſhes one ſpecies or ſort of bodies from all other ſpecies or ſorts; and this term we ſhall briefly explain. Gold is apparently different from lead, and from every other ſpecies of metal; a horſe is apparently different from an ox, and from every other ſpecies of animals; and all animals apparently differ from all vegetables, as vegetables differ from metals.

157 According to the Peripatetics and Platoniſts, from eſſential forms;

It is only with the *bodies*, not the minds of animals, that we are at preſent concerned; and we have ſeen that all bodies are compoſed of the ſame matter.—What then is it that makes different bodies exhibit to us ſuch different appearances; or, in other words, how come they to be poſſeſſed of ſuch different qualities and powers? It is (ſay the followers of Plato and Ariſtotle) from their having different *eſſential forms*, by which every natural ſubſtance is eſſentially characteriſed; for of every animal, vegetable, or metal, &c. there is a *form* conceived as exiſting before the individuals in which it is incorporated, from which reſult all the properties of that animal, vegetable, or metal, ſuch as *figure*, *ſize*, *colour*, and the other qualities

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(L) Υπολαβε τοινυν ουτωσι κατα τα ομματα πρωτον, ὁ δε καλεις χρωμα λευκον μη ειναι αυτο ετερον τι εξω των σων ομματων, μηδ᾽ εν τοις ομμασι, αλλα μελαν τε και λευκον και ὁτιουν αλλο χρωμα εκ της προσβολης των ομματων προς την προσηκουσαν φοραν φανειται γεγενημενον και ο δε εκαστον ειναι φαμεν χρωμα, ουτε το προσβαλλον ουτε το προσβαλλομενον αλλα μεταξυ τι εκαστω ιδιον γεγονος.

(M) Protagoras was a follower of Leucippus and Democritus in every thing, and of courſe an atheiſt.—This, however, does not hinder him from having been a correct phyſiologiſt with reſpect to the compoſition of body; and as ſuch only is he quoted by us. It is, indeed, melancholy to think, that there was hardly a ſect of ancient philoſophers in which there were not many atheiſts.

(N) Αρχη δε εξ, ἡς α νυν δη ελεγομεν παντα ηρτηται ἡδε αυτων, ὡς το παν κινησις ην και αλλο παρα τουτο ουδεν, της δε κινησεως δυο ειδη, πληθει μεν απειρον ἑκατερον, δυναμιν δε το μεν ποιειν εχον, το δε πασχειν, &c.——See the *Theætetus*; ſee alſo *Cudworth's Intellectual Syſtem*, Book I. chap. i.

Of the Essences of Bodies.

ties perceptible by our ſenſes: but this *internal and eſſential form* itſelf, from which all other forms reſult, is not perceptible by our ſenſes, nor even by our underſtanding directly and immediately, nor otherwiſe than by the analogy formerly mentioned. Theſe eſſential forms, we are told, mean ſomething, which, though different from matter, can yet never ſubſiſt without it; ſomething which, united with it, helps to produce every *complete* being, that is to ſay, in other words, every natural ſubſtance in the viſible world.

158 But theſe forms have no exiſtence.

This aſſertion Mr Harris ſubmits with deference to his contemporaries; becauſe (ſays he) "I ſpeak perhaps of ſpectres as ſhocking to ſome philoſophers as thoſe were to Æneas which he met in his way to hell—*Terribiles viſu formæ.*" The elegant author's unwillingneſs to frighten his contemporaries, was a proof of his amiable and benevolent diſpoſition; but he needed not to have ſuffered from any ſuch apprehenſion. Thoſe ſpectres, apparently ſo dreadful, had long before been laid to reſt by the incomparable Cudworth, who has demonſtrated, that *eſſential forms* different from matter and motion, as they have no real exiſtence, had no place in the moſt ancient philoſophy; and that the different appearances or ſenſible qualities which different bodies exhibit, are the reſult of the different contexture of their inſenſible parts. Thus, gold and lead are compoſed of the ſame primary matter, but the atoms or minute parts of that matter are in the one ſubſtance differently combined from what they are in the other; and this different combination is the ſole cauſe that gold is ſpecifically heavier than lead, more ductile, and of a different colour, &c. For the very ſame reaſon, iron is harder than either gold or lead, ſpecifically lighter, and poſſeſſed of many other ſenſible qualities which are not found in either of theſe ſubſtances. One vegetable differs from another externally in ſize, colour, taſte, ſmell, rapidity of growth, and proportion of parts, &c. but all vegetables are compoſed of the ſame matter; and the external difference which prevails among them is the reſult of a different ſtructure and motion of their inſenſible parts. The ſame is to be ſaid of the differences which prevail among the bodies of animals; they all reſult from internal organization and motion, and from nothing elſe, whatever be the immediate cauſe of that motion.

159 The real eſſences of bodies unknown to us.

This particular internal texture and motion of inſenſible parts, is that which makes one ſort of bodies differ externally from every other ſort of bodies; and it is by modern metaphyſicians called the *real eſſence* of bodies. Thus, that internal texture of minute parts, which makes gold of a bright yellow, extremely ductile, ſpecifically heavier than all other metals, and ſoluble in *aqua regia*, is the real eſſence of gold; but what that eſſence is in itſelf no man can tell, as we perceive only the qualities which reſult from it. We are, however, certain, that it is different from the real eſſences of lead and iron, becauſe it produces different effects from thoſe which are produced by theſe eſſences; and different effects are never produced in the ſame circumſtances by the ſame cauſe.

We have called the internal texture and motion of the inſenſible parts of bodies their *real eſſences*, to diſtinguiſh them from other *eſſences* which are only *nominal*, and with which we are perfectly acquainted, becauſe they are the fabrication of our own minds.—Thus, a beautiful bright yellow, a certain ſpecific gravity, extreme ductility, and ſolubility in *aqua regia*, are the qualities by which we diſtinguiſh gold from all other metals. Of theſe qualities we frame a ſort of general conception, which we call the *eſſence* of gold; and every ſubſtance in which we find this eſſence, we claſs under the ſpecific name gold. For though it is obvious that our conceptions cannot be the *real eſſences* of things external, yet are they ſufficient guides to theſe eſſences, as we know that bodies which, being all formed of the ſame matter, have the very ſame ſenſible qualities, muſt likewiſe have the ſame internal organization or texture of parts, becauſe it is only in that organization or texture that one body can differ from another.—And ſo much for bodily ſubſtance, qualities, and eſſences.

Of the Exiſtence of Matter.

160 Nominal eſſences, what they are.

Chap. III. *Of the* Existence *of* Matter.

161 Berkeley attempts to demonſtrate that matter has no exiſtence.

We have endeavoured to prove, that all corporeal ſubſtances conſiſt of minute atoms, ſolid and extended; and that the ſenſible qualities of every body reſult from the combination and motion of the atoms of which that body is compoſed. The celebrated Berkeley, Biſhop of Cloyne, however, attempted to demonſtrate that theſe atoms have no real exiſtence; and that the very ſuppoſition of a ſolid, extended, and inert ſubſtance, being the archetype of our ideas, involves in it an abſurdity and contradiction.

It is univerſally allowed, that all our knowledge of matter is derived through the ſenſes, either immediately in the very act of ſenſation, or mediately by an aſſociation which is reſolvable into a proceſs of reaſoning. According to the principles which we have ſtated, and laboured to eſtabliſh, matter itſelf is no immediate object of the ſenſes; and as theſe are the principles upon which the Biſhop erected his demonſtration, it will be incumbent upon us to conſider his theory, becauſe it has been repreſented as in the higheſt degree pernicious, and as leading to univerſal ſcepticiſm.

162 The view of his theory given by his antagoniſts.

The author of the *Eſſay on the Nature and Immutability of Truth*, repreſents Berkeley as teaching us, "that external objects (that is, the things which we take for external objects) are nothing but ideas in *our* minds; in other words, that they are in every *reſpect* different from what they appear to be; that matter exiſts not but in *our* minds; and that independent on *us* and *our* faculties, the earth, the ſun, and the ſtarry heavens, have no exiſtence at all; that a lighted candle hath not *one* of *thoſe qualities* which it *appears to have*; that it is not white, nor luminous, nor round, nor diviſible, nor extended; but that, for any thing we know, or can ever know to the contrary, it may be an Egyptian pyramid, the king of Pruſſia, a mad dog, the iſland of Madagaſcar, Saturn's ring, one of the Pleiades, or nothing at all." With reſpect to the conſequences of this theory, he affirms, that "it is ſubverſive of man's moſt important intereſts, as a moral, intelligent, and percipient being; and not only ſo, but alſo, that if it were univerſally and ſeriouſly adopted, Of the Existence of Matter.

ed, the diſſolution of ſociety, and the deſtruction of mankind, would neceſſarily enſue within the compaſs of a month.

The diſſolution of ſociety and the deſtruction of mankind are indeed diſmal conſequences; enough to make a man ſhudder in his cloſet. But do they really flow from Berkeley's ſyſtem? They certainly do, if it be the aim of that ſyſtem to prove that a candle has not any one quality which it appears to have, and that it may be a *mad dog*: for ſhould all philoſophers, by ſome means or other, become converts to the theory of Berkeley, as we know that the biſhops Sherlock, Smalridge, and others actually did, the diſſolution of ſociety and the deſtruction of mankind would indeed be inevitable. The ſcribbling race, by uſing mad dogs for candles, would all become infected with the hydrophobia; and having their natural irritability augmented by the canine rabies, they would bite and tear till not a human being were left alive.

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A view of his theory given by himſelf.

But to drop this ludicrous ſtyle, ſo unſuitable to philoſophical inveſtigation and calm enquiry, we beg leave to affirm, that the theory of Berkeley is here totally and groſsly miſrepreſented, and that not one of thoſe dangerous conſequences which flow from that miſrepreſentation can be fairly deduced from any thing taught in *The Principles of Human Knowledge* and the *Dialogues on the Exiſtence of Matter*. So far is Berkeley from teaching that external things are nothing but ideas in *our* minds, and that they are in every reſpect different from what they appear to be, that he teaches the very reverſe of this in the plaineſt language poſſible. "I am of a vulgar caſt (ſays he), ſimple enough to believe my ſenſes, and leave things as I find them. It is my opinion, that the real things are thoſe very things I ſee and feel and perceive by my ſenſes. That a thing ſhould really be perceived by my ſenſes, and at the ſame time not really exiſt, is to me a plain contradiction. When I deny ſenſible things an exiſtence out of the mind, I do not mean *my* mind in particular, but *all* minds. Now it is plain they have an exiſtence exterior to my mind, ſince I find them by experience to be independent of it. There is therefore ſome other mind wherein they exiſt during the intervals between the times of my perceiving them; as likewiſe they did before my birth, and would do after my annihilation. And as the ſame is true with regard to all other finite created ſpirits, it neceſſarily follows there is an *omnipotent eternal mind*, which knows and comprehends all things, and exhibits them to our view in ſuch a manner, and according to ſuch rules, as he himſelf hath ordained, and are by us termed the laws of nature."

So far is Berkeley from teaching that, independent on *us* and *our* faculties, the earth, the ſun, and the ſtarry heavens, have no exiſtence at all, and that a lighted candle has not one of thoſe qualities which it appears to have, that he over and over affirms the direct contrary; that the univerſe has a real exiſtence in the mind of that infinite God in whom, according to the ſcriptures, we all live, and move, and have our being; that a lighted candle has not only all thoſe qualities which it appears to have, but that, with reſpect to us, it has nothing elſe; that ſo far from being continually deceived by our ſenſes, we are never deceived by them; and that all our miſtakes concerning matter are the reſult of [illegible] tions.

The Biſhop makes the ſame diſtinction that we have made between ideas and notions; reſtricting the uſe of the former term to denote the relicts of ſenſation, and employing the latter to denote our knowledge or conception of ſpirits and all ſuch objects as are not perceived by ſenſe. He likewiſe affirms, that we can have no *idea* of an external unperceived ſubſtance; becauſe an idea can be like nothing but another idea, or the ſenſation of which it is a relict: and as all mankind admit that ideas and ſenſations can have no exiſtence but in the mind of a percipient being, he therefore infers that we can have no *idea* of any thing exiſting unperceived, and by conſequence can have no idea of matter in the philoſophical ſenſe of that word. Solidity, extenſion, diviſibility, motion, figure, colour, taſte, and all thoſe things which are uſually called qualities primary and ſecondary, being according to him mere ideas, can have no exiſtence but in a mind perceiving them; but ſo far is he from ſuppoſing their exiſtence to depend upon the perception of our minds, that he ſays expreſsly, "When in broad day-light I open my eyes, it is not in my power to chooſe whether I ſhall ſee or no, or to determine what particular objects ſhall preſent themſelves to my view; and ſo likewiſe as to the hearing and other ſenſes, the ideas imprinted on them are not creatures of my will. There is therefore, ſome other will or ſpirit that produces them. The queſtion between the materialiſts and me is not, Whether things have a real exiſtence out of the mind of *this* or *that* perſon? but, Whether they have an abſolute exiſtence, diſtinct from being perceived by *God*, and exterior to *all minds?* I aſſert, as well as they, that ſince we are affected from without, we muſt allow powers to be without in a being diſtinct from ourſelves. So far we are agreed. But then we differ as to the kind of this powerful being. I will have it to be ſpirit; they matter, or I know not what third nature. Thus I prove it to be ſpirit: From the effects I ſee produced, I conclude there are actions; and becauſe actions, volitions (for I have no notion of any action diſtinct from volition); and becauſe there are volitions, there muſt be a will. Again, the things I perceive muſt have an exiſtence, they or their archetypes, out of my mind: but being ideas, neither they nor their archetypes can exiſt otherwiſe than in an underſtanding: there is therefore an underſtanding. But will and underſtanding conſtitute in the ſtricteſt ſenſe a mind or ſpirit. The powerful cauſe, therefore, of my ideas is, in ſtrict propriety of ſpeech, a ſpirit."

164
That theory, however improbable, certainly poſſible, and

This is a faithful abſtract of Berkeley's theory given in his own words. Matter, according to him, cannot be the *pattern* or *archetype* of ideas, becauſe an idea can reſemble nothing but another idea, or the ſenſation of which it is a relict. Matter, he thinks, cannot be the *cauſe* of ideas; for every cauſe muſt be active, and matter is deemed to be inert and incapable of action. He therefore infers, that all our ſenſations of what we call the qualities of body are the effect of the immediate agency of the Deity upon our minds; and that corporeal ſubſtance has no exiſtence, or at leaſt that we have no evidence of its exiſtence. That ſuch may *poſſibly* be the origin of our ſenſations, no man will deny who reflects upon the infinite power and wiſdom of the Agent from whom they are ſaid to proceed. Dr Reid himſelf, the ableſt of all Dr Berkeley's opponents, frankly acknowledges that no man "can ſhow, by any good argument, that all our ſenſations might not have been as they are, though no body or quality of body had ever exiſted."

165 In its conſequences harmleſs.

In its conſequences we do not perceive that this theory can be hurtful either to religion, to virtue, or to the buſineſs of common life; for it only explodes the notion of a ſubſtratum, which, though it may have a real exiſtence, was never thought of by the generality of mankind in any nation under heaven. Dr Beattie indeed affirms, that in "leſs than a month after the nonexiſtence of matter ſhould be univerſally admitted, he is certain there could not, without a miracle, be one human creature alive on the face of the earth." But this aſſertion muſt be the conſequence of his miſtaking Berkeley's nonexiſtence of matter for the nonexiſtence of ſenſible objects, the reality and exiſtence of which the Biſhop never denied. On the contrary, he expreſsly ſays, "We are ſure that we really ſee, hear, feel; in a word, that we are affected with ſenſible impreſſions; and how are we concerned any farther? I *ſee* this cherry, I *feel* it, I *taſte* it; and I am ſure *nothing* cannot be ſeen, or felt, or taſted: it is therefore *real*. Take away the ſenſations of ſoftneſs, moiſture, redneſs, tartneſs, and you take away the cherry." All this is equally true and equally conceivable, whether the combined ſenſations which indicate to us the exiſtence of the cherry be the effect of the immediate agency of God or of the impulſe of matter upon our minds; and to the lives of men there is no greater danger in adopting the former than the latter opinion.

166 A conſequence of Berkeley's theory; which

But it has been ſaid, that Berkeley's doctrine neceſſarily leads to ſcepticiſm in religion, as the ſame kind of reaſoning which he employs to prove the non-exiſtence of matter, operates equally againſt the exiſtence of mind, and conſequently againſt the poſſibility of a future ſtate of rewards and puniſhments. "The rational iſſue of this ſyſtem (we are told) is ſcepticiſm with regard to every thing excepting the exiſtence of our ideas and their neceſſary relations. For ideas being the only object of thought, and having no exiſtence but when we are conſcious of them, it neceſſarily follows that there is no object of our thought which can have a continued and permanent exiſtence. Body and ſpirit, cauſe and effect, time and ſpace, to which we were wont to aſcribe an exiſtence independent of our thought, all are turned out of exiſtence by this ſhort dilemma: Either thoſe things are ideas of ſenſation or reflection, or they are not: If they are ideas of ſenſation or reflection, they can have no exiſtence, but when we are conſcious of them: If they are not ideas of ſenſation or reflection, they are words without any meaning."

This inference was advanced as a conſequence from Berkeley's principles by Mr Hume; and upon theſe principles it has been deemed unanſwerable by ſubſequent philoſophers of great merit. But is it really a part of Berkeley's ſyſtem? or can it be fairly inferred from the principles on which that ſyſtem is built? Theſe queſtions it is fit that Berkeley ſhould anſwer for himſelf; and we ſhall venture to aſſert, that his anſwer will be perfectly ſatisfactory to every reader who attends to the diſtinction, which, after the Biſhop, we have ſtated between ideas and notions.

167 That author foreſaw and

Though we believe this dangerous inference from Berkeley's principles is commonly attributed to Hume as its author, it did not eſcape the ſagacity of the Biſhop himſelf. In the third dialogue, *Hylas*, who pleads for the exiſtence of matter, thus objects to the reaſoning of his antagoniſt. "Notwithſtanding all you have ſaid, to me it ſeems, that according to your own way of thinking, and in conſequence of your own principles, it ſhould follow, that you are only a ſyſtem of floating ideas, without any ſubſtance to ſupport them. Words are not to be uſed without a meaning. And as there is no more meaning in ſpiritual ſubſtance than in material ſubſtance, the one is to be exploded as well as the other."

168 Obviated; but

To this *Philonous* anſwers: "How often muſt I repeat, that I know or am *conſcious* of my own being; and that I myſelf am not my ideas, but ſomewhat elſe; a thinking active principle, that perceives, knows, wills and operates about ideas? I know that I, one and the ſame ſelf, perceive both colours and ſounds; that a colour cannot perceive a ſound, nor a ſound a colour; that I am therefore one independent principle, diſtinct from colour and ſound; and, for the ſame reaſon, from all other ſenſible things and inert ideas. But I am not in like manner *conſcious* either of the exiſtence or eſſence of matter. Farther, I know what I mean, when I affirm that there is a ſpiritual ſubſtance or ſupport of ideas; *i. e.* that a ſpirit knows and perceives ideas. But I do not know what is meant, when it is ſaid that an unperceiving ſubſtance hath inherent in it, and ſupports, either ideas or the archetypes of ideas. In the very notion or definition of material ſubſtance there is included a manifeſt repugnace and inconſiſtency. But this cannot be ſaid of the notion of ſpirit. That ideas ſhould exiſt in what doth not perceive, or be produced by what doth not act, is repugnant. But it is no repugnancy to ſay, that a perceiving thing ſhould be the ſubject of ideas, or an active being the cauſe of them, That I, who am a ſpirit or thinking ſubſtance, exiſt, I know as certainly as I know that my ideas exiſt. I know likewiſe what I mean by the terms *I* and *myſelf;* and I know this immediately or intuitively; though I do not perceive it as I perceive a triangle, a colour, or a ſound. Ideas are things inactive and perceived; and ſpirits a ſort of beings altogether different from them, by which they are perceived. I do not, therefore, ſay, that my ſoul is an idea, or like an idea, However, taking the word *idea* in a large ſenſe, my ſoul may be ſaid to furniſh me with an idea, that is, an image or likeneſs of God, though indeed extremely inadequate. For all the notion I have of God is obtained by reflecting on my own ſoul, heightening its powers, and removing its imperfections. I have, therefore, though not an inactive idea, yet in myſelf ſome ſort of an active thinking image of the Deity. And though I perceive him not by ſenſe, yet I have a notion of him, or know him, by reflection and reaſoning. My own mind and my own ideas I have an immediate knowledge of; and by the help of theſe do immediately apprehend the *poſſibility* of the exiſtence of other ſpirits and ideas. Farther, from my being, and from the dependency I find in myſelf and my ideas, I do by an act of reaſon *neceſſarily* infer the exiſtence of a God, and of all created things in the mind of God. It is granted that we have neither an immediate evidence, nor a demonſtrative knowledge, of the exiſtence of *other finite ſpirits*; but it will not therefore follow, that ſuch ſpirits are on a footing with material ſubſtances: if, to ſuppoſe the one be inconſiſtent, and if it be not inconſiſtent to ſuppoſe the other; if the one can be inferred by no argument, and there is a probability of the other; if we ſee ſigns and effects indicating diſtinct finite agents like ourſelves, and ſee no ſign or ſymptom whatever that leads to a rational belief of matter. I ſay, laſtly, that I have a *notion* of ſpirit, though I have not, ſtrictly ſpeaking, an *idea* of it. I do not perceive it as an idea, or by means of an idea; but know it by reflection. Whereas, I neither perceive matter objectively as I do an idea, nor know it as I do myſelf by a reflex act; neither do I mediately apprehend it by ſimilitude of the one or the other, nor yet collect it by reaſoning from that which I know immediately. All which makes the caſe of matter widely different from that of the Deity and all ſpirits."

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Not ſatiſfied with this, he endeavours to prove the exiſtence of matter impoſſible.

Thus far we think Berkeley's theory tenible, and its conſequences harmleſs. That by the immediate agency of the Deity all our ſenſations *might* be what they are, though matter had no exiſtence, we think he has proved by arguments unanſwerable; and we are likewiſe of opinion, that by admitting the evidence of ſenſe, conſciouſneſs, and reaſon, in their fulleſt extent, and by diſtinguiſhing properly between thoſe things of which we have *ideas*, and thoſe of which we have *notions*, he has ſufficiently ſecured the exiſtence of ſpirits or percipient beings, and obviated the irreligious ſophiſtry of Hume before it was conceived by that author. But the good Biſhop ſtops not here. Not ſatisfied with proving that all our ſenſations lead us immediately to the Deity, and that, for aught we know, matter, as defined by philoſophers, may have no ſeparate exiſtence, he proceeds farther, and endeavours to prove that matter cannot poſſibly exiſt. This appears even in the extracts which we have quoted from his book, in which he talks of the repugnance and inconſiſtency of the notion. In this part of his ſyſtem, we think he errs greatly, and advances an opinion altogether inconſiſtent with his own juſt principles.

170
His reaſoning

The repugnance of which he ſpeaks, ariſes ſolely from conſidering ſolidity and extenſion as relicts of ſenſation, or ideas of the ſame kind with thoſe of heat and cold, taſtes and ſounds. "Light, and colours, heat and cold, extenſion and figures; in a word, the things we ſee and feel; what are they (ſays his Lordſhip), but ſo many ſenſations, notions, ideas, or impreſſions, on ſenſe? and is it poſſible to ſeparate even in thought any of theſe from perception? Some there are who make a diſtinction betwixt *primary* and *ſecondary* qualities: by the former, they mean extenſion, figure, motion, reſt, ſolidity or impenetrability, and number: by the latter, they denote all other ſenſible qualities, as colours, ſounds, taſtes, and ſo forth.—The ideas we have of theſe they acknowledge not to be the reſemblances of any thing exiſting without the mind, or unperceived; but they will have our ideas of the primary qualities to be patterns or images of things which exiſt without the mind, in an unthinking ſubſtance which they call *matter*. But it is evident that extenſion, figure, and motion, are only ideas exiſting in the mind; that without extenſion ſolidity cannot be conceived; that an idea can be like nothing but another idea; and that conſequently neither they nor their archetypes can exiſt in an unperceiving ſubſtance. Hence it is plain, that the very notion of what is called *matter* or *corporeal ſubſtance*, involves a contradiction in it."

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fallacious.

This account of extenſion and ſolidity affords a ſtriking inſtance how much the moſt vigorous and upright mind is liable to be warped by prejudice in behalf of a darling theory, and how apt the cleareſt underſtanding is to be blinded by the equivocal uſe of terms. That Biſhop Berkeley poſſeſſed a vigorous and perſpicacious mind, his moſt vehement antagoniſts are eager to admit; and that his intentions were good, is known to all Europe. Yet by the equivocal uſe of the word *idea*, which the writings of Locke had then introduced into the language of philoſophy, he has here ſuffered himſelf to loſe ſight of a very proper and accurate diſtinction, which, ſo far as we know, was among the moderns firſt made by himſelf between *ideas* and *notions*. According to the Biſhop, "we have a *notion* of power and a *notion* of ſpirits, but we can have no *idea* either of the one or the other; for all ideas being paſſive and inert, they cannot repreſent unto us by way of image or likeneſs that which acts. Such is the nature of *ſpirit* or that which acts, that it cannot be of itſelf perceived, but only by the effects which it produceth. It muſt be owned, however, that we have ſome *notion* of ſoul, ſpirit, and the operations of the mind, ſuch as willing, loving, hating, inaſmuch as we know or underſtand the meaning of theſe words."

Now we beg leave to affirm, that what is here ſaid of ſpirits, and of which we readily admit the truth, is equally true of material or ſolid ſubſtances. We have no *ideas* of ſolidity and extenſion, becauſe theſe things are not originally impreſſed upon the ſenſes; but we have very diſtinct, though relative *notions* of them, for they are clearly perceived by the effects which they produce. That this is at leaſt poſſible we have the acknowledgment of Biſhop Berkeley himſelf: for he "freely owns, that from a cauſe, effect, operation, ſign, or other circumſtance, there may reaſonably be inferred the exiſtence of a thing not immediately perceived; and that it were abſurd for any man to argue againſt the exiſtence of that thing, from his having no direct and poſitive notion of it." This is exactly the caſe with reſpect to ſolid ſubſtances. Theſe ſubſtances we do not immediately perceive; but we infer their exiſtence from effects, ſigns, and other circumſtances, and we have of them very clear though relative notions. Thus a man can open and ſhut his empty hand; but when he graſps an ivory ball of three or four inches diameter, he feels, that though the ſame power be exerted, his hand cannot then be ſhut. He is conſcious that there is no change in himſelf; and being intuitively certain that every effect muſt have a cauſe, he infers with the utmoſt confidence, that the cauſe which prevents his hand from ſhutting is in the ball; or, in other words, that the thing which communicates to his eye the ſenſation of colour, and impreſſes upon his hand a ſenſation of touch, muſt be ſolid or impenetrable. Solidity, however, is not the ſenſation itſelf; it is only the cauſe of the ſenſation; and therefore it is ſo far from being an idea in our minds, that we are conſcious our notion of it is of a thing totally different from all our ideas, of a thing external, at leaſt to our minds. Indeed the notion itſelf is not poſitive; it is only relative, and inferred from the effects which are produced on our ſenſes. That it is the *ſame* thing which communicates to our eye the ſenſation of colour, and has the power of reſiſting the compreſſion of our hand, is evident; becauſe, when the ball is thrown away, the reſiſtance as well as the actual ſenſation vaniſh at once.

172 The idea of colour and the notion of ſolidity not naturally inſeparable.

From this fact, which a leſs acute man would think a proof that the reſiſtance was not occaſioned by the immediate agency of the Supreme Being, but by the impenetrability of a ſolid ſubſtance of ſmall dimenſions, the Biſhop argues thus againſt the *poſſibility* of ſuch a ſubſtance: "They who aſſert that figure, motion, and the reſt of the primary or original qualities, do exiſt without the mind in unthinking ſubſtances, do at the ſame time acknowledge, that colours, ſounds, heat, cold, and ſuch like ſecondary qualities, do not; which they tell us are ſenſations exiſting in the mind alone, that depend on and are occaſioned by the different ſize, texture, and motion, of the minute particles of matter. This they take for an undoubted truth, which they can demonſtrate beyond all exception. Now if it be certain, that thoſe original qualities are inſeparably united with the other ſenſible qualities, and not even in thought capable of being abſtracted from them, it plainly follows, that they exiſt only in the mind. But I deſire any one to reflect and try whether he can by any abſtraction of thought conceive the extenſion and motion of a body, without all other ſenſible qualities. For my own part, I ſee evidently that it is not in my power to frame an idea of a body extended and moved, but I muſt withal give it ſome colour or other ſenſible quality, which is acknowledged to exiſt only in the mind. In ſhort, extenſion, figure, and motion, abſtracted from all qualities, are inconceivable. Where, therefore, the other ſenſible qualities are, there muſt be theſe alſo, to wit, in the mind, and no where elſe."

In this reaſoning, though plauſible, there is an unintended fallacy. It is indeed true, that we cannot contemplate in imagination a ſolid ſubſtance without conceiving it to have ſome colour; but there is ſufficient reaſon to believe, that this union of colour and ſolidity in our minds is not the effect of nature as it operates at firſt upon our ſenſes, but merely the conſequence of early and deep-rooted aſſociation. Biſhop Berkeley himſelf has taught us, that the objects of ſight are not at a diſtance; and that if a man born blind were ſuddenly made to ſee, he would conceive the objects of his ſight as exiſting either in his eye or in his mind. This is a truth which no man will controvert who has dipt into the ſcience of optics, or who has even paid the ſlighteſt attention to the perceptions of infants; and if ſo, it follows, that to a man born blind and ſuddenly made to ſee, colour and ſolidity would not appear united. Were ſuch a perſon to lay hold of an ivory ball and raiſe it to the elevation of his eye, he would perceive whiteneſs as a new ſenſation exiſting in his eye or his mind, but he would feel reſiſtance at the extremity of his arm. He would not have the leaſt reaſon to conclude, that this whiteneſs was inſeparably united to the cauſe of this reſiſtance; and he would, in fact, draw no ſuch concluſion, till experience had taught him, that by removing the ball or cauſe of reſiſtance from his hand, he at the ſame time removed the ſenſation from his eye. After repeated experiments, he would indeed diſcover, that the cauſe of colour to the eye, was likewiſe by ſome means or other the cauſe of reſiſtance to the hand; and he would ſo aſſociate theſe in his mind, that the one would never afterwards make its appearance as an idea or a notion without bringing the other along with it. The whole difficulty, therefore, in this caſe, is to break an early and deep-rooted aſſociation; for it is plain that the aſſociated ideas were not originally united, and that ſolidity and colour were at firſt conceived as ſeparate.

If the reader perceive not the force of this reaſoning, we beg leave to recommend to him the following experiment, which, if we miſtake not, will carry conviction to his judgment, that in the laſt quoted paſſage Biſhop Berkeley has argued fallaciouſly, and that extenſion and colour are not *inſeparably* united as ideas in the mind. Let him go into a dark room, containing a number of ſpherical bodies of various colours; let him take one of them into his hand; and he will inſtantly *feel* reſiſtance, and have a *notion* of extenſion and ſolidity; but will he likewiſe have the *idea* of colour inſeparably united with this notion? The Biſhop ſays he will: and if ſo, it muſt be the idea of ſome *particular* colour; for his Lordſhip has taught us, that the *abſtract* and *general* idea of colour, which is neither *red*, nor *green*, nor *blue*, &c. cannot poſſibly be formed. The man, then, we ſhall ſuppoſe, whilſt he feels reſiſtance, conceives the reſiſting body to be *green;* and holding it ſtill in his hand, walks into the light of day. The *reſiſtance*, and conſequently the *cauſe* of reſiſtance, remains unchanged; but what becomes of the inſeparable union of thoſe with colour, when the body, upon being actually ſeen, proves to be *black*, i. e. to have no colour at all?—It appears, therefore, undeniable, that ſolidity and colour are not united in nature; that the one is an eſſential quality of ſomething external to us, of which we have no *idea*, but a very diſtinct though relative *notion;* and that the other is an actual ſenſation in our minds, cauſed by the impreſſion of ſomething external on the organ of ſenſe, which leaves behind it in the memory or imagination a poſitive and direct *idea* that exiſts no where elſe.

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Solid ſubſtance, therefore *may* exiſt, for though it is not immediately perceived by the ſenſes, and is a thing of which we can have no *idea*, we acquire a clear and diſtinct *notion* of it, by the very ſame means which Biſhop Berkeley thinks ſufficient to give us diſtinct notions of power and of ſpirits; and, therefore, that notion can involve in it no contradiction. Still, however, we would not ſay with Dr Beattie, "that we could as eaſily believe, that two and two are equal to ten; or, that whatever is, is not; as that matter has no ſeparate exiſtence:" for it is certainly *poſſible*, that the Supreme Being, without the inſtrumentality of matter, could communicate to our minds all the ſenſations and motions from which we infer the reality of ſolid ſubſtance. All that we contend for, as having the evidence of demonſtration, is the *poſſibility* of ſolid and extended ſubſtance; and if the thing be *poſſible*, the general voice of mankind proclaims its *probability*.— We are *conſcious* of our actual ſenſations, and we know by *experience* that they are cauſed by ſomething diſtinct from ourſelves. When a man graſps an ivory ball, he *feels* that he cannot ſhut his hand, and he knows that the reſiſtance which prevents him proceeds *not* from *himſelf*. Thus far all mankind are agreed. But Biſhop Berkeley ſays, that the reſiſtance proceeds immediately from the Supreme Being or ſome other ſpirit; whilſt we, without pretending that his ſcheme is impoſſible, think it more natural to ſuppoſe that the man's hand is kept from ſhutting by the reſiſtance of a ſolid ſubſtance of four inches diameter; of which ſubſtance, though we have no *idea* of it, we have as diſtinct a *notion* as Berkeley had of ſpirits. From one or other of theſe cauſes this effect muſt proceed; and it is of little importance to life or happineſs which of them be the true cauſe, ſince it is with the effect only that we are immediately concerned. Still, however, a philoſopher would chooſe to adopt the eaſieſt and moſt natural ſide of every alternative; which, if our notion of ſolidity be juſt, is certainly, in the preſent caſe, the exiſtence of matter.

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is by ſome philoſophers denied to be ſolid.

After treating ſo largely of the compoſition of bodies, and ſhowing the general agreement of metaphyſicians ancient and modern with reſpect to the notion of their ſolidity, it will appear ſtrange to the leſs philoſophical part of our readers, that we ſhould now expreſs a doubt of that notion's being well-founded.— We have ourſelves no doubt, but on the contrary are fully convinced, that ſolidity is eſſential to matter. This, however, has of late been denied by philoſophers of great merit. Dr Prieſtley, after Mr Mitchell and Father Boſcovich, affirms that matter is *not ſolid* or impenetrable to other matter; and that it has, in fact, no properties but thoſe of *attraction* and *repulſion*‡. The proofs of this poſition, which appears ſo paradoxical, he draws from optical experiments, from electricity, and from the effects of heat and cold upon ſubſtances uſually conceived to be ſolid.

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The arguments uſed in ſupport of this hypotheſis.

The appearances from which the ſolidity of matter is inferred, are nothing more, he ſays, than ſuperficial appearances, and therefore have led to ſuperficial and falſe judgments, which the *real appearances* will not authoriſe. "*Reſiſtance*, on which alone our opinion concerning the ſolidity or impenetrability of matter is founded, is never occaſioned by *ſolid matter*, but by ſomething of a very different nature, viz. a *power of repulſion*, always acting at a real, and in general an aſſignable diſtance, from what we call the body itſelf. When I preſs my hand againſt the table, I naturally imagine that the obſtacle to its going through the table, is the *ſolid matter* of which it conſiſts; but a variety of philoſophical conſiderations demonſtrate that it generally requires a much greater power of preſſure than I can exert to bring my fingers into actual contact with the table. Electrical appearances ſhow that a conſiderable weight is requiſite to bring into ſeeming contact even the links of a chain hanging freely in the air, they being kept aſunder by a repulſive power belonging to a very ſmall ſurface, ſo that they do not actually touch, though they are ſupported by each other. It has been ſhown, from optical conſiderations, that a drop of water rolls upon a cabbage leaf without ever coming into actual contact with it; and indeed all the phenomena of *light* are moſt remarkably unfavourable to the hypotheſis of the ſolidity or impenetrability of matter. When light is reflected back from a body on which it ſeems to ſtrike, it was natural to ſuppoſe that this was occaſioned by its impinging againſt the *ſolid parts* of the body; but it has been demonſtrated by Sir Iſaac Newton, that the rays of light are always reflected by a *power of repulſion* acting at ſome diſtance from the body. Again, when part of a beam of light has overcome this power of repulſion, and has entered any tranſparent ſubſtance, it goes on in a right line, provided the medium be of an uniform denſity, without the leaſt interruption, and without a ſingle particle being reflected, till it comes to the oppoſite ſide, having met with no ſolid particles in its way, not even in the denſeſt tranſparent ſubſtances, as glaſs, cryſtal, or diamond; and when it is arrived at the oppoſite ſide, it is ſolely affected by the laws of attraction and repulſion.

"Nay, that the component particles of the hardeſt bodies themſelves do not actually touch one another, is demonſtrable from their being brought nearer together by cold, and by their being removed farther from each other by heat. The power ſufficient to overcome theſe internal forces of repulſion, by which the ultimate particles of bodies are prevented from coming into actual contact, is what no perſon can pretend to compute. The power requiſite to break their coheſion, or to remove them from the ſphere of each other's attraction, may in ſome meaſure be eſtimated; but this affords no *data* for aſcertaining the force that would be neceſſary to bring them into actual contact, which may exceed the other almoſt infinitely."

From theſe facts, Dr Prieſtley infers, that the mutual reſiſtance of bodies proceeds in all caſes from powers of repulſion acting at a diſtance from each body: that the ſuppoſition of the *ſolidity* or *impenetrability* of matter is deſtitute of all ſupport whatever; and that matter itſelf is nothing but powers of attraction and repulſion, and ſeveral ſpheres of them, one within another. As other philoſophers have ſaid, "Take away ſolidity, and matter vaniſhes;" ſo he ſays expreſsly, "Take away attraction and repulſion, and matter vaniſhes."

To illuſtrate this ſtrange notion, "Suppoſe (ſays he) that the Divine Being, when he created *matter* only fixed certain *centres of various attractions and repulſions*, extending indefinitely in all directions, the whole effect of them to be upon each other; theſe centres approaching to, or receding from each other; and conſequently carrying their peculiar ſpheres of attraction and repulſion along with them, according to certain definite circumſtances. It cannot be denied that theſe ſpheres may be diverſified infinitely, ſo as to correſpond to all the kinds of bodies that we are acquainted with, or that are poſſible. For all effects in which bodies are concerned, and of which we can be ſenſible by our eyes, touch, &c. may be reſolved into attraction or repulſion. A compages of theſe centres, placed within the ſpheres of each others attraction, will conſtitute a body that we term *compact*; and two of theſe bodies will, on their approach, meet with a repulſion or reſiſtance ſufficient to prevent one of them from occupying the place of the other, without a much greater force than we are capable of employing; ſo that to us they will appear perfectly hard.

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‡ Diſquiſitions on Matter and Spirit, and Correſpondence with Dr Price.

"As, in the conſtitution of all actual bodies that we are acquainted with, theſe centres are placed ſo near to each other, that in every diviſion that we can make we ſtill leave parts which contain many of theſe centres; we, reaſoning by analogy, ſuppoſe that every particle of matter is infinitely diviſible; and the *ſpace* it occupies is certainly ſo. But, ſtrictly ſpeaking, as thoſe centres which conſtitute any body are not abſolutely infinite, it muſt be naturally poſſible to come by diviſion to one ſingle centre, which could not be ſaid to be diviſible, or even to occupy any portion of ſpace, though its ſphere of action ſhould extend ever ſo far; and had only *one* ſuch centre of attraction, &c. exiſted, its exiſtence could not have been known, becauſe there would have been nothing on which its action could have been exerted; and there being no *effect*, there could not have been any ground for ſuppoſing a *cauſe*."

In anſwer to this reaſoning againſt the ſolidity of matter, Dr Prieſtley was frequently aſked by his candid and maſterly antagoniſt *, "What it is that attracts and repels, and that is attracted and repelled?" But to the queſtion he was never able to give a ſatisfactory anſwer. Indeed, how could he have been able? for, as Dr Price argues, "Excluſive of attraction and repulſion, he affirms matter to be abſolutely nothing; and therefore, though we were to allow it the power of attracting and repelling, yet as it is nothing but this power, it muſt be the power of nothing, and the very idea of it be a contradiction."

* Free Diſcuſſion between Dr Price and Dr Prieſtley.

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founded on fallacious appearances and contrary to an intuitive and neceſſary truth.

If there be any claſs of truths intuitively certain, that claſs comprehends the two following propoſitions: POWER CANNOT BE WITHOUT A SUBJECT; and NOTHING CAN ACT WHERE IT IS NOT. If, therefore, there be powers of attraction and repulſion, (which ſhall be conſidered afterwards in the chapter of MOTION), there muſt be a ſubject of thoſe powers; and if matter, whether ſolid or unſolid, be the ſubject, it cannot poſſibly attract or repel at a *diſtance*. Sir Iſaac Newton, in his letters to Dr Bentley, calls the notion that matter poſſeſſes an innate power of attraction, or that it can act upon matter at a diſtance, and attract and repel by its own agency, "an abſurdity into which, he thought no one could poſſibly fall." Hence it follows, that the appearances from which Dr Prieſtley infers the penetrability of matter muſt be fallacious appearances, ſince they contradict an intuitive and neceſſary truth. The facts which he inſtances are, indeed, ſuch as would make moſt other men ſuſpicious of fallacy, and in his reaſonings from them he ſometimes takes for granted the truth to be proved. The links of a chain uſed for electrical purpoſes, ſuppoſing them to be in contact with each other, can touch only with very ſmall ſurfaces. The electrical fluid is of conſiderable denſity, and incapable of being abſorbed within a very narrow compaſs. This is evident, becauſe it paſſes not through paper and other porous bodies without making a paſſage for itſelf, and leaving a viſible aperture behind it; and though it aſſimilates with metals, and paſſes through them more eaſily than through other bodies, yet it is plain that it requires a certain quantity of metal to conduct it; for when the conductor falls ſhort of the neceſſary quantity, it is melted or diſſipated by the force of the fluid. This being the caſe, it follows that the links of a chain *may be* in actual contact (we do not poſitively affirm that they *are*), and yet the fluid become viſible in paſſing from link to link; for if the point of contact be too ſmall to abſorb the *whole* fluid, *part* of it muſt paſs without any metallic conductor through the atmoſphere, and thus become apparent to the eye of the ſpectator.

With reſpect to light, it is obvious that there cannot poſſibly be any *demonſtration*, in the logical ſenſe of the word, that it is reflected by a power of repulſion acting at ſome diſtance from the body; for, in the opinion of all mankind, the primary and ſolid atoms of matter are too minute to fall under the cogniſance of our ſenſes, however aſſiſted by art; and therefore, if light *appears* to be reflected at a diſtance from the ſurface of the body, we muſt conclude, either that between the point of reflection and the apparent ſurface of the body, there are ſolid atoms unperceived by us, or that light is reflected by the agency of ſome other ſubſtance than matter. One of theſe concluſions, we ſay, *muſt* be drawn, becauſe they are both *poſſible*, and there is no other alternative but to admit one of them, or to ſuppoſe that a thing may act where it is not; which is as clearly abſurd and *impoſſible* as that *whatever is, is not.* Again, when part of a beam of light has entered any tranſparent ſubſtance, how does Dr Prieſtley know that it goes on in a right line, without the leaſt interruption, till it comes to the oppoſite ſide? This he can know only by his ſenſes; but the beam may meet with ten thouſand interruptions from objects which the ſenſes cannot perceive, and may deſcribe a zig-zag line, of which the deflections are ſo ſmall as to elude the keeneſt eye aided by the moſt powerful glaſs.

That the component particles of the hardeſt bodies do not *all* actually touch one another, is indeed evident from the effects of cold and heat upon thoſe bodies: but it does not therefore follow that thoſe bodies have no component particles; but only, that they are fewer in number than we are apt to imagine; that all the ſolid matter in the univerſe might poſſibly be compreſſed within a very narrow ſphere; and that it is held together in different bodies and different ſyſtems by a power foreign from itſelf. Theſe are truths which all philoſophers have admitted who have thought ſufficiently on the ſubject; but who will admit Dr Prieſtley's propoſition, when it is tranſlated into common Engliſh: "That the component *nothings* of the hardeſt bodies do not actually touch one another, is demonſtrable from their being brought nearer together by cold, and by their being removed farther from each other by heat?"

Dr Prieſtley owns, that if matter be ſolid it could act upon other matter by impulſe. We are certain, that, whatever it be, it can act upon nothing in the manner

177 Our moſt adequate notion of matter,

manner which he deſcribes; and therefore, to uſe the words of Dr Price, "matter, if it be any thing at all, muſt conſiſt of ſolid particles or atoms occupying a certain portion of ſpace, and therefore *extended*, but at the ſame time *ſimple* and *uncompounded*, and incapable of being reſolved into any other ſmaller particles. It muſt likewiſe be the different form of theſe *primary* particles, and their different combinations and arrangement, that conſtitute the different bodies and kinds of matter in the univerſe." This is exactly agreeable to the doctrines of Newton; who, after conſidering the queſtion in every point of view, concludes, that "in the beginning God formed matter in ſolid, maſſy, hard, impenetrable, moveable particles, of ſuch ſizes and figures, and with ſuch other properties, as moſt conduced to the end for which he formed them; and that thoſe primary particles being ſolid, are incomparably harder than any porous bodies compounded of them; even ſo very hard as never to wear or break in pieces: no ordinary power being able to divide what God himſelf made one in the creation." To talk, as Dr Prieſtley does, of matter's being certain *centres of various attractions and repulſions* extending indefinitely in all directions, and to deſcribe theſe centres as *not* being *phyſical points* or *ſolid atoms*, is either to ſay, that *nothing* attracts and repels; or it is to introduce the divine agency as the immediate cauſe of all our ſenſations. The former of theſe alternatives Dr Prieſtley diſclaims; the latter he ſeems willing to admit. But if it be his meaning that all our ſenſations are cauſed by the immediate agency of God or created ſpirits, his ſcheme differs not from that of Berkeley, except in being leſs elegantly expreſſed and leſs ingeniouſly ſupported. Berkeley's ſcheme is evidently *poſſible*. The commonly received ſcheme is likewiſe poſſible. It remains therefore with the reader, whether he will adopt the ſyſtem of the Biſhop of Cloyne; or admit, with all other philoſophers, that matter exiſts; that it conſiſts of parts actually diſtinct and ſeparable; and that each of theſe parts is a *monad* or ſolid atom, which requires no foreign agency to keep it united.

CHAP. IV. *Of* SPACE *and its* MODES.

178 The neceſſary adjuncts of body, what.

HAVING conſidered bodies in their ſubſtance, eſſences, and qualities, and proved that they have a real exiſtence independent of us and our conceptions, we proceed now to inquire into the nature of *ſpace*, *motion*, *number*, and *duration*. Theſe are commonly called the *adjuncts* of body, and are ſuppoſed to be abſolutely inſeparable from its exiſtence. It does not indeed appear that *actual motion* is a neceſſary adjunct of body, conſidered as a mere ſolid, extended, and figured ſubſtance; but it is certainly neceſſary to the exiſtence of organized and animated bodies; and the capability of being moved enters into our conceptions of all bodies whatever. Of theſe adjuncts, that which firſt demands our attention is *ſpace*; for without a knowledge of its nature we could not have an adequate idea of motion, and without motion we could have no idea of time.

179 Our notion of ſpace, how acquired.

Every body is extended; and between two bodies not in actual contact, we perceive that a third body may be eaſily introduced. That which admits of the introduction of the third body is what we call *ſpace*: and if it be totally void of matter, it is called *pure ſpace*. Whether there be any ſpace abſolutely pure, has been diſputed; but that ſuch ſpace is poſſible, admits of no diſpute. Were any one body (a cannon ball for inſtance) to be annihilated, and the circumambient air, with every other material ſubſtance, kept from ruſhing into the ſpace which the ball had occupied, that portion of ſpace, with reſpect to matter, would be empty or pure ſpace: whether it would neceſſarily be filled with mind ſhall be conſidered afterwards. Pure ſpace, therefore, is conceivable; and it is conceived as having three dimenſions, length, breadth, and depth, which are generally called the three ſimple modes of ſpace. In this reſpect it agrees with body: but the agreement proceeds no farther; for ſpace is conceived as deſtitute of ſolidity, without which the exiſtence of body is inconceivable. It has been formerly obſerved, that whatever may be diſtinctly conceived may poſſibly exiſt; but with reſpect to the exiſtence of pure ſpace, whatever is poſſible is real: for it ſhall be ſhown in the next ſection, that were there no ſpace abſolutely pure or void of matter, there could be no motion. Our buſineſs at preſent is to inquire what the nature of ſpace is, and what notion we ought to have of its exiſtence.

180 Space ſuppoſed to be ſomething different from body and mind, and to be eternal and infinite, &c.

Many modern philoſophers conſider ſpace as ſomething entirely diſtinct both from body and mind: ſome of them aſcribe to it no leſs than four of the attributes of the Deity—*eternity*, *immobility*, *infinity*, and *neceſſary exiſtence*; and a few of them have gone ſo far as to call *infinite ſpace* the *ſenſorium* of the Deity. "The ſuppoſal of the exiſtence of *any thing whatever* (ſays Dr Clarke *) neceſſarily includes a *preſuppoſition* of the exiſtence of *ſpace*. Nothing can poſſibly be conceived to exiſt without thereby preſuppoſing ſpace; which, therefore, I apprehend to be a *property* or *mode* of the ſelf-exiſtent Subſtance; and that, by being evidently neceſſary itſelf, it proves, that the ſubſtance of which it is a property muſt be alſo neceſſary." Elſewhere he ſays, that "ſpace is a property or mode of the ſelf-exiſtent Subſtance, but not of any other ſubſtances. All other ſubſtances are *in* ſpace, and are *penetrated* by it; but the ſelf-exiſtent Subſtance is not in ſpace, nor penetrated by it, but is itſelf (if I may ſo ſpeak) the *ſubſtratum* of ſpace, the *ground* of the Exiſtence of *ſpace* itſelf." He acknowledges, however, that ſuch expreſſions as "the ſelf-exiſtent Subſtance is the *ſubſtratum* of ſpace, or ſpace is a property of the ſelf-exiſtent Subſtance, are *not*, perhaps, very proper: but what I mean (ſays he), is this: The idea of *ſpace* (as alſo of *time* or *duration*) is an abſtract or partial idea; an idea of a certain *quality* or *relation*, which we evidently ſee to be neceſſarily exiſting; and yet (which not being itſelf a *ſubſtance*) at the ſame time neceſſarily *preſuppoſes* a ſubſtance, without which it could not exiſt."

Theſe opinions reſpecting ſpace have been adopted by ſucceeding philoſophers of great merit, and particularly by Dr Price; who ſays, that "it is a maxim which cannot be diſputed, that *time* and *place* are neceſſary to the exiſtence of all things. Dr Clarke (continues he) has made uſe of this maxim, to prove that infinite ſpace and duration are the eſſential properties of the Deity; and I think he was right."

Had authority any weight in philoſophy, we know not what modern writers we could oppoſe to the celebrated

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* Demonſtration of the Being and Attributes of God, and Correſpondence with a Gentleman in Glouceſterſhire, paſſim.

181
This ſuppoſition controverted.

brated names of Clarke and Price, unleſs it were Biſhop Berkeley, Dr Law late biſhop of Carliſle, and the author of Ancient Metaphyſics. But the queſtion is not to be decided by authority. Learned and acute as Dr Clarke was, his aſſertions reſpecting ſpace are contradictory and inconſiſtent. If nothing can poſſibly be conceived to exiſt without thereby preſuppoſing the exiſtence of *ſpace*, how can ſpace be a property or mode of the ſelf-exiſtent ſubſtance? Are properties prior in the order of nature, or even in our conceptions, to the ſubſtances in which they inhere? Can we frame an abſtract idea of figure, or extenſion, or ſolidity, before we conceive the exiſtence of any one figured, extended, or ſolid ſubſtance? Theſe are queſtions which every man is as capable of anſwering as the Doctors Clarke and Price, provided he can look attentively into his own mind, and trace his ideas to their ſource in ſenſation: and if he be not biaſſed by the weight of great names, we are perſuaded he will find, that if it be indeed true, that the ſuppoſal of the exiſtence of any thing whatever neceſſarily includes a *preſuppoſition* of the exiſtence of ſpace, *ſpace* cannot poſſibly be a *property* or *mode* of the ſelf-exiſtent ſubſtance, but muſt of neceſſity be a *ſubſtance* itſelf.

182
Space neceſſary to the exiſtence of every thing.

It is, however, *not* true, that the ſuppoſal of the exiſtence of any thing whatever neceſſarily includes a preſuppoſition of the exiſtence of ſpace. The idea of ſpace is indeed ſo cloſely aſſociated with every viſible and moſt tangible objects, that we cannot ſee the one nor feel the other without conceiving them to occupy ſo much of ſpace. But had we never poſſeſſed the ſenſes of ſight and touch, we could not have ſuppoſed the exiſtence of ſpace neceſſary to the exiſtence of any thing whatever. The ſenſes of ſmelling, taſting, and hearing, together with our internal powers of conſciouſneſs and intellect, would certainly have compelled us to believe in our own exiſtence, and to ſuppoſe the exiſtence of other things; but no object either of conſciouſneſs, ſmelling, taſting, or hearing, can be conceived as occupying ſpace. Space and every thing which fills it are conceived as of three dimenſions; but who ever ſuppoſed or can ſuppoſe an *odour*, *taſte*, or *ſound*, to have *length*, *breadth*, and *depth*; or an object of conſciouſneſs to be an ell or an inch long?

Let us ſuppoſe that body and all the viſible world had a beginning, and that once nothing exiſted but that Being which is alone of neceſſary as well as eternal exiſtence; *ſpace*, ſay the followers of Dr Clarke, would then exiſt likewiſe without bounds or limits. But we deſire to know of theſe gentlemen what ſort of a being this ſpace is. It certainly is not *ſubſtance*; neither is it a property; for we have ſeen that the very notions of it, which lead men to ſuppoſe its exiſtence *neceſſary*, render it impoſſible to be a property of the ſelf-exiſtent Being. Is it then nothing? It "is in one ſenſe*: it is nothing *actually* exiſting; but it is ſomething *potentially*; for it has the *capacity* of receiving body whenever it ſhall exiſt. It is not, and cannot, become any thing itſelf, nor hath it any actual exiſtence; but it is that without which nothing corporeal could exiſt." For this reaſon it was that Democritus and Epicurus made ſpace one of the principles of nature; and for the ſame reaſon Ariſtotle has made *privation* one of his three principles of natural things, *matter* and *form* being the other two. But though the privation of *one* form be doubtleſs neceſſary before matter can receive another (for a piece of wax or clay cannot receive the form of a *globe* before it loſe the form of a ſquare), yet Ariſtotle never dreamed that the privation of the ſquare was any property of the globe, or that *privation* itſelf was to be reckoned a real being. On the contrary, he expreſsly calls it το μη ον, or *the no being*. In this way, if we pleaſe, we may conſider ſpace, and call it the *privation of fulneſs* or of body. We have indeed a poſitive idea of it, as well as of ſilence, darkneſs, and other privations: but to argue from ſuch an idea of ſpace, that ſpace itſelf is ſomething real, ſeems altogether as good ſenſe as to ſay, that becauſe we have a different idea of *darkneſs* from that of *light*, of *ſilence* from that of *ſound*, of the *abſence* of any thing from that of its *preſence*; therefore *darkneſs*, *ſilence*, *abſence*, muſt be real things, and have as poſitive an exiſtence as *light*, *ſound*, and *body*: and to deny that we have any poſitive idea, or, which is the very ſame thing, any idea at all, of the privations above-mentioned, will be to deny what is capable of the moſt complete proof (ſee n° 19.), and to contradict common ſenſe and daily experience. There are therefore ideas, and ſimple ones too, which have nothing *ad extra* correſpondent to them; no proper *ideatum*, archetype, or objective reality: and we do not ſee why the idea of ſpace may not be reckoned of that number. To ſay that *ſpace* muſt have exiſtence, becauſe it has ſome properties (for inſtance, *penetrability*, or the *capacity* of receiving body), ſeems† to be the ſame thing as to urge that *darkneſs* muſt be *ſomething* becauſe it has the capacity of *receiving light*; *ſilence* the property of admitting *ſound*; and *abſence* the property of being ſupplied by *preſence*. To reaſon in this manner is to aſſign abſolute negations; and ſuch as, in the ſame way, may be applied to *nothing*, and then call them *poſitive properties*; and ſo infer that the chimera, thus cloathed with them, muſt needs be *ſomething*.

183
Space nothing but the poſſible exiſtence of body.

But it is ſaid, that as we cannot conceive ſpace to be annihilated, it muſt be ſome real thing of eternal and neceſſary exiſtence. If this argument had not been uſed by writers of great merit, and with the beſt intention, we ſhould not have ſcrupled to call it the moſt contemptible ſophiſm that ever diſgraced the page of philoſophy. Whatever now has an *actual* exiſtence, muſt from eternity have had a *poſſible* exiſtence in the ideas of the Divine mind. Body, as an extended ſubſtance, has now an *actual* exiſtence; and therefore it muſt from eternity have had a *poſſible* exiſtence in the ideas of the Divine mind: but the *poſſible exiſtence of body* is all that we can conceive by *ſpace*; and therefore this argument, upon which ſo much ſtreſs has been laid, amounts to nothing more, than that what has from eternity been poſſible, can at no period have been impoſſible. It is evident that the *capacity* or *potentiality* of every thing exiſting muſt have been from eternity; but is capacity or potentiality a real being? All the men and women who ſhall ſucceed the preſent generation to the end of time, have at this moment a poſſibility of exiſtence, nor can that poſſibility be conceived as an impoſſibility; but is it therefore any thing actually exiſting either as a ſubſtance or a quality?

It has been urged, that ſpace muſt be ſomething more than the mere abſence of matter; becauſe if nothing

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* Ancient Metaphyſics.

† See Notes on King's Origin of Evil, and Law's inquiry into the Ideas of Space, &c.

thing be between bodies, ſuch as the walls of a room, they muſt neceſſarily touch. But ſurely it is not *ſelf-evident* that bodies muſt neceſſarily touch if nothing be between them; nor of the truth of this propoſition can any thing like a proof be brought. It is indeed intuitively certain, that "things, when they are in contact, have nothing between them;" and hence it has been raſhly inferred, that things, when they have nothing between them, are in contact; but this is an illegitimate converſion of the propoſition. Every logician knows, that to convert a propoſition, is to infer from it another whoſe *ſubject* is the *predicate*, and whoſe *predicate* is the *ſubject*, of the propoſition to be converted: but we are taught by Ariſtotle and by common ſenſe, that an *univerſal* affirmative can be converted only into a *particular* affirmative. "Things, when they are in contact, have nothing between them," is an *univerſal* affirmative propoſition; and therefore it can be converted only into the following *particular* affirmative: "Some things, when they have nothing between them, are in contact;" a propoſition which by no means includes in it the contact of the walls of an empty room. The reaſon why the walls of an empty room do not touch, is that they are *diſtant*; but is *diſtance*, in the abſtract, any thing really exiſting? Two individuals differ, or there is a difference between them; but is *difference* itſelf any real external thing? Bodies are long, broad, thick, heavy; but are *length*, *breadth*, *denſity*, *weight*, properly any thing? Have they any real ſeparate archetypes or external idiata? Or can they exiſt but in ſome ſubſtance?

184 The fallacy which led to the ſuppoſition that ſpace is a real thing.

The reaſon why ſo many philoſophers have conſidered ſpace as a real external thing, ſeems to be this: Every bodily ſubſtance is extended; but ſpace is conceived to be that which contains body, and therefore to ſpace we likewiſe attribute extenſion. Extenſion is a quality which can have no exiſtence but as united with other qualities in ſome ſubſtance; and it is that of which, abſtracted from all ſubſtances, we can, properly ſpeaking, form no *idea*. We underſtand the meaning of the word, however, and can reaſon about that which it denotes, without regarding the particular ſubſtance in which extenſion may inhere; juſt as we can reaſon about whiteneſs without regarding any one white object, though it is ſelf-evident that whiteneſs, abſtracted from all objects, cannot figure in the mind as an idea. Qualities conſidered in this manner are general and relative notions, the objects of pure intellect, which make no appearance in the imagination, and are far leſs, if poſſible, to be perceived by ſenſe: but it is extremely painful to the mind to dwell upon ſuch notions; and therefore the ever-active fancy is always ready to furniſh them with imaginary *ſubſtrata*, and to make that which was a *general* and *inviſible notion* be conceived as a *particular ideal object*. In the caſe of extenſion this is the more eaſily done, that the notion which we have of a *real ſubſtratum* or ſubſtance, the ſupport of real qualities, is obſcure and relative, being the notion of *ſomething* we know not what. Now, by leaving, if we can, ſolidity and figure out of our conception, and joining the notion of *ſomething* with the notion of *extenſion*, we have at once the *imaginary ſubſtratum* of an *imaginary* quality, or the general notion of extenſion particulariſed in an imaginary ſubject; and this ſubject we call *ſpace*, vainly fancying that it has a real external and independent exiſtence. Whether this be not all that can be ſaid of ſpace, and whether it be not abſurd to talk of its having any real properties, every man will judge for himſelf, by reflecting upon his own ideas and the manner in which they are acquired. We ourſelves have no doubt about the matter. We conſider pure ſpace as a mere notion relative to the exiſtence of corporeal ſubſtance, as nothing more than the abſence of body, where body is poſſible; and we think the uſual diſtinction between *abſolute* and *relative* ſpace, if taken as real, the groſſeſt abſurdity. We do not, however, pretend to dictate to others; but recommend it to every man to throw away all reſpect for great names, to look attentively into his own thoughts, and on this as on all metaphyſical ſubjects to judge for himſelf.

[illegible] it is.

Having ſaid ſo much of ſpace in general, we need not waſte much time upon its modes. Indeed the only mode of ſpace, after conſidering it with reſpect to the three dimenſions of body, which now demands our attention, is that which we call *place*. As in the ſimpleſt mode of ſpace we conſider the relation of diſtance between any two bodies or points; ſo, in our idea of *place*, we conſider the relation of diſtance betwixt any thing, and any two or more points, which, being conſidered as at reſt, keep the ſame diſtance one from another. Thus, when we find any thing at the ſame diſtance now at which it was yeſterday from two or more points with which it was then compared, and which have not ſince the compariſon was made changed their diſtance or poſition with reſpect to each other, we ſay that the thing hath kept its *place*, or is in the *ſame place*; but if it hath ſenſibly altered its diſtance from either of thoſe points, we then ſay that it hath changed its *place*.

From this view of the nature of place, we need not obſerve that it is a mere relation; but it may be worth while to advert to this circumſtance, that a thing may without falſehood be ſaid to have continued in the ſame place, and at the ſame time to have changed its place, according to the different objects with which it is compared. Thus, if two perſons find a company of cheſs-men ſtanding each upon the ſame ſquare of the cheſs-board where they left them, the one may with truth affirm that they are all in the *ſame place*, or unmoved; and the other may with equal truth affirm that they have all changed *place*. The former conſiders the men only with reſpect to their diſtances from the ſeveral parts of the cheſs-board, which have kept the ſame diſtance and poſition with reſpect to one another. The latter muſt conſider the men with reſpect to their diſtance from ſomething elſe: and finding that the cheſs-board, with every thing upon it, has been removed, we ſhall ſuppoſe from one room to another, he cannot but ſay that the cheſs-men have changed their place with reſpect to the ſeveral parts of the room in which he formerly ſaw them.

This modification of diſtance, however, which we call *place*, being made by men for their common uſe, that by it they may deſign the particular poſition of objects where they have occaſion for ſuch deſignation, they determine this *place* by reference to ſuch adjacent things as beſt ſerve their preſent purpoſe, without regarding other things which, for a different purpoſe, would better determine the place of the ſame object.

Thus in the cheſs-board, the uſe of the *deſignation of the place* of each cheſs-man being determined only within that chequered piece of wood, it would croſs that purpoſe to meaſure it by any thing elſe: but when theſe very cheſs-men are put up in a box, if any one ſhould aſk where the black king is, it would be proper to *determine the place* by reference to ſomething elſe than the cheſs-board; ſuch as the parts of the room or cloſet which contain the box.

186 The univerſe has no place.

That our idea of *place* is nothing but ſuch a relative poſition of things as we have mentioned, will be readily admitted, when it is conſidered that we can have no idea of the place of the *univerſe*. Every *part* of the univerſe has place; becauſe it may be compared with reſpect to its diſtance from other parts ſuppoſed to be fixed. Thus the earth and every planet of our ſyſtem has a place which may be determined by aſcertaining its diſtance from the ſun and from the orbits of the other planets; and the place of the ſyſtem itſelf may be aſcertained by comparing it with two or more fixed ſtars: but all the ſyſtems taken as *one whole* can have no *place*; becauſe there is nothing elſe to which the diſtance and poſition of that whole can be referred. It is indeed true, that the word *place* is ſometimes uſed, we think improperly, to denote that *ſpace* or portion of *ſpace* which any particular body occupies; and in this ſenſe, no doubt, the univerſe has place, as well as the earth or ſolar ſyſtem: but to talk of the place of the univerſe in the other and proper ſenſe of the word, is the groſſeſt nonſenſe.

CHAP. V. *Of* MOTION.

187 Mobility eſſential to every corporeal ſubſtance, but not natural motion.

MOBILITY, or a capacity of being moved, is eſſential to every corporeal ſubſtance; and by actual motion are all the operations of nature performed. Motion, therefore, if it may be called an *adjunct* of body, is certainly the moſt important of all its adjuncts; and to aſcertain its nature and origin demands the cloſeſt attention of the metaphyſician, as well as of the mechanic and aſtronomer. With the *laws* of motion, as diſcovered by experience, we have at preſent no concern; they are explained and fully eſtabliſhed in other articles of this work (ſee MECHANICS, MOTION, &c.). The principal queſtions which we have to conſider are, "What is motion? and, By what power is it carried on?"

For an anſwer to the firſt of theſe queſtions, the modern metaphyſician refers every man to his own ſenſes; becauſe, in his apprehenſion, the word motion denotes a ſimple idea which cannot be defined. Among the ancients, the Peripatetics were of a different opinion; and Ariſtotle, whoſe love of dialectic made him define every thing, has attempted to give two definitions of *motion*. As ſome learned men are at preſent labouring to revive this ſyſtem, we ſhall, out of reſpect to them, mention theſe definitions, and make upon them ſuch remarks as to us appear proper.

188 The Peripatetic definitions of motion

The author of *Ancient Metaphyſics* having obſerved, that both nature and art propoſe ſome end in all their operations; that when the end is obtained, the thing operated upon is in a ſtate of perfection or completion; and that in the operations of both nature and art there is a progreſs, and by conſequence a change, from one thing to another; adds, that this change is *motion*. Motion, therefore, according to him, is a change or progreſs to the end propoſed, or to that ſtate of perfection or completion which Ariſtotle calls εντελεχεια. It is not enough, however, that we know *to what* the change or progreſs is made: to have an adequate idea of motion, we muſt likewiſe know *from what* it proceeds. Now it is evident that every thing exiſting, whether by nature or art, was, before it exiſted, poſſible to exiſt; and therefore, adds the ſame author, things do in ſome ſort exiſt even before they exiſt. This former kind of exiſtence is ſaid by Ariſtotle to be εν δυναμει, that is, in *power* or *capacity*. In this way, plants exiſt in their ſeeds; animals in the embryo; works of art in the idea of the artiſts and the materials of which they are made; and, in general, every thing in the cauſes which produce it. From this power or capacity there is a progreſs to *energy* or actual exiſtence; ſo that we are now able to anſwer the queſtion, "*from what*, and *to what*, motion is a change?" for it is univerſally true of all *motion*, that it is a change from *capacity* to *energy*.

"Having thus diſcovered that *motion* lies betwixt *capacity* and *energy*, it is evident (he ſays) that it muſt have a connection with each of them: and from this double connection Ariſtotle has given us two definitions of it; one of them taken from the *energy*, or end to which it tends; the other from the *capacity* from which it begins. The firſt is expreſſed in two words, viz. ενεργεια ατελης or *imperfect energy*; the other is εντελεχεια του εν δυναμει ἡ εν δυναμει; which may be tranſlated thus, *The perfection of what is in capacity, conſidered merely as in capacity*. The meaning of the laſt words is, that nothing is conſidered in the thing that is moved but merely its *capacity*; ſo that motion is the perfection of that capacity, but not of the thing itſelf. It is ſomething more (adds the learned author) than mere *capacity*; for it is capacity exerted, which when it has attained its end, ſo that the thing has arrived at that ſtate to which it is deſtined by nature or art, ceaſes, and the thing begins to exiſt ενεργεια, or *actually*."

189 unintelligible,

By all the admirers of Ariſtotle, this latter definition has been preferred to the former; for what reaſon, it is difficult to ſay. They both involve in the thickeſt obſcurity that which, viewed through the ſenſes, is very eaſily underſtood; and on this, as on many other occaſions, Ariſtotle was certainly guilty of darkening counſel by words without knowledge. The author, whoſe comment on this wonderful definition we have faithfully abridged, admits that it is not intelligible till we know what *change* and *progreſs* are; but is it poſſible to conceive any *change* to take place in bodily ſubſtances without *motion*? or, if we were called upon to explain what progreſs is, could we do it better than by ſaying that it is motion *from* ſomething *to* ſomething? It is likewiſe very obvious, that before we can have an adequate idea of *motion*, we muſt, according to this definition, know perfectly what the words *capacity*, *energy*, and *perfection* denote; and yet nothing can be more true than that *perfection* denotes a complex conception, which may be eaſily defined by reſolving it into the ſimple ideas and notions of which it is compounded, whilſt *motion* is ſuſceptible of no ſuch reſolution. The perfection of a knife is compounded of the temper of the ſteel and the

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the ſharpneſs of the edge: the perfection of a ſyſtem of philoſophy conſiſts of the importance of the ſubjects treated, the ſtrength of the author's arguments, and the perſpicuity of his ſtyle and manner; but of what is the *motion* of a ball, or *an atom*, or any thing elſe, compounded? We are aware that to this queſtion the modern Peripatetics will reply, that it is not the motion of a *ball*, or an *atom*, or any *one thing*, that their maſter has ſo learnedly defined, but motion abſtracted from *all individuals*, and made an object of pure intellect; and they will likewiſe affirm, that by the word *perfection* uſed in the definition, he does not mean *any one kind* of perfection as adapted to any particular *object* or *end*, but perfection abſtracted from *all objects* and *all ends*. The perfection of *nothing* and the motion of *nothing*, for ſuch ſurely are that motion and that perfection which are abſtracted from *all objects* and *ends*, are ſtrange expreſſions. To us they convey no meaning; and we have reaſon to think that they are equally unintelligible to men of greater acuteneſs (o). In a word, *motion* muſt be ſeen or felt; for it cannot be defined. To call it the *act of changing place*, or a *paſſage from one place to another*, gives no information; for *change* and *paſſage* cannot be conceived without previouſly conceiving *motion* (p).

190 The Peripatetic diviſion of motion abſurd.

The Peripatetics having idly attempted to *define* motion, proceed next to *divide* it into four kinds or claſſes. This diviſion was by the father of the ſchool pretended to be made from the effects which it produces, and was ſaid by him to belong to three categories, viz. *quality*, *quantity*, and *where* (ſee CATEGORY). The firſt kind is that well known *motion* from *place* to *place*, which falls under the category laſt mentioned; the ſecond is *alteration*, by which the quality of any thing is changed, the ſubſtance remaining the ſame. This belongs to the category of *quality*. The third is *increaſe*, and the fourth *diminution*, both belonging to the category of *quantity*. The ancient atomiſts; and all the modern metaphyſicians of eminence, have with great propriety rejected this diviſion as being nothing but a collection of abſurd diſtinctions where there is in nature no difference. It has been already ſhown, that body has no other real qualities than *ſolidity*, *extenſion*, and *figure*: but of theſe the firſt cannot be altered without deſtroying the ſubſtance; for every thing which is material is equally ſolid. The extenſion of a body may indeed be enlarged, and its figure may be altered, while the ſubſtance remains the ſame; but that alteration can be made only by moving from their *places* the ſolid atoms of which the body is compoſed. Ariſtotle's ſecond kind of motion therefore differs not from the firſt; nor do the third and fourth differ from theſe two. For a body cannot be *increaſed* without acquiring new matter, nor diminiſhed without loſing ſome of the matter of which it was originally compoſed: but matter can neither be added nor taken away without motion from place to place; for there is now no creation *de novo*; and we have no reaſon to imagine that, ſince the original creation, a ſingle atom has been ever annihilated. It is therefore paſt diſpute, that local motion is the only motion conceivable; and indeed, as far as we are capable of judging from what we know of body, it is the only motion poſſible.

191 Whether, if but one body exiſted, there could be motion?

This has given riſe to a queſtion which has been debated among modern philoſophers, though, as far as we know, it was never agitated among the ancients, viz. "Whether if there were but one ſolid body exiſting, that body could poſſibly be moved." Biſhop Berkeley ſeems to be of opinion that it could not; becauſe no motion can be conceived but what has a direction towards ſome *place*, and the relation of place neceſſarily ſuppoſes the exiſtence of two or more bodies. Were all bodies, therefore, annihilated except one globe, it would be impoſſible (he thinks) to conceive that globe in motion (q). With reſpect to the

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(o) "Nunc dicendum de natura motus. Atque is quidem, cum ſenſibus clare percipiatur, non tam natura ſua, quam doctis philoſophorum commentis obſcuratus eſt. Motus nunquam in ſenſus noſtros incurrit ſine mole corporea, ſpatio et tempore. Sunt tamen qui motum, tanquam ideam quandam ſimplicem et abſtractam, atque *ab omnibus aliis rebus ſejunctam*, contemplari ſtudent. Verum idea illa tenuiſſima et ſubtiliſſima *intellectus aciem eludit*: id quod quilibet ſecum meditando experiri poteſt. Hinc naſcuntur magnæ difficultates de natura motus, et definitiones, ipſa re quam illuſtrare debent longe obſcuriores. Hujuſmodi ſunt definitiones illæ Ariſtotelis et ſcholaſticorum, qui motum dicunt eſſe *actum mobilis quatenus eſt mobile*, vel, *actum entis in potentia quatenus in potentia*. Hujuſmodi etiam eſt illud viri inter recentiores celebris, qui aſſerit *nihil in motu eſſe reale præter momentaneum illud quod in vi ad mutationem nitente conſtitui debet*. Porro conſtat, horum et ſimilium definitionum auctores in animo habuiſſe abſtractam motus naturam, ſecluſa omni temporis et ſpatii conſideratione, explicare: ſed qua ratione abſtracta illa motus quinteſſentia (ut ita dicam) intelligi poſſit non video."

Berkeley de Motu.

(p) "Multi etiam per *tranſitum* motum definiunt, obliti ſcilicet tranſitum ipſum ſine motu intelligi non poſſe, et per motum definiri oportere: Veriſſimum adeo eſt definitiones, ſicut nonnullis rebus lucem, ita viciſſim aliis tenebras afferre. Et profecto, quaſcumque res ſenſu percipimus, eas clariores aut notiores definiendo efficere vix quiſquam potuerit. Cujus rei vana ſpe allecti res faciles difficillimas reddiderunt philoſophi, menteſque ſuas difficultatibus, quas ut plurimum ipſi peperiſſent, implicavere." *Id. ibid.*

(q) Having proved that *place*, in the proper ſenſe of the word, is merely relative, and affirmed that all *motion* is relative likewiſe, the Biſhop proceeds thus: "Veruntamen ut hoc clarius appareat, animadvertendum eſt, motum nullum intelligi poſſe ſine determinatione aliqua ſeu directione, quæ quidem intelligi nequit, niſi præter corpus motum, noſtrum etiam corpus, aut aliud aliquid, ſimul intelligatur exiſtere. Nam ſurſum, deorſum, ſiniſtrorſum, dextrorſum, omneſque plagæ et regiones in relatione aliqua fundantur, et neceſſario corpus a moto diverſum connotant et ſupponunt. Adeo ut, ſi, reliquis corporibus in nihilum redactis, globus, exempli gratia, unicus exiſtere ſupponatur; in illo motus nullus concipi poſſit: uſque adeo neceſſe eſt, ut detur

[illegible] appears [illegible]; yet we do not perceive how it concludes against the possibility of motion in [illegible]. It has been already shown in the chapter of [illegible], that [illegible] can be conceived which [illegible], yet many things may be possible which we have no faculties or means to conceive. In the present instance, were this solitary globe animated as our bodies are, were it endowed with all our ſenſes and mental powers, it certainly would not acquire any *idea* of motion though impelled by the greateſt force. The reaſon is obvious; it would have no objects with which to compare its place and ſituation at different periods of time; and the experience of a ſhip at ſea in calm weather, affords ſufficient proof that motion which is equable cannot be perceived by any other means than by ſuch a compariſon. When the waves ſwell and the ſhip pitches, it is indeed impoſſible that thoſe who are on board ſhould not perceive that they are actually in motion; but even this perception ariſes from comparing their poſition with that of the waves riſing and falling around them: whereas in the regions of empty ſpace the animated globe could compare its poſition with nothing; and therefore, whether impelled by equal or unequal forces, it could never acquire the *idea* of motion. It may perhaps be thought, that if this ſolitary globe were a *ſelf*-moving animal, it might acquire the *idea* of motion by inferring its exiſtence from the energy which produced it. But how, we would aſk, could an animal in ſuch circumſtances be *ſelf*-moving? Motion is the effect of ſome cauſe; and it has been already ſhown (ſee n° 118. of this article), that we have no reaſon to ſuppoſe that any being can be the *real* and *primary* cauſe of any effect which that being can neither conceive nor will: but as motion can be perceived only by the ſenſes, a ſolitary animal could have no idea of motion previous to its own exertions; and therefore could neither conceive, nor will, an exertion to produce it. Let us, however, ſuppoſe, that without any end in view it might ſpontaneouſly exert itſelf in ſuch a manner as would produce *ſenſible* motion, were it ſurrounded with other corporeal objects; ſtill we may venture to affirm, that ſo long as it ſhould remain in abſolute ſolitude, the being itſelf would acquire no *idea* of motion. It would indeed be *conſcious* of the *mental* energy, but it could not infer the exiſtence of motion as a conſequence of that energy; for the idea of motion can be acquired only by ſenſe, and by the ſuppoſition there are no objects from which the ſenſes of this ſpherical animal could receive thoſe impreſſions, without which there can be no perception, and of courſe no ideas.

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192 Anſwered in the affirmative.

Let us now ſuppoſe, that, while this animated globe is under the influence either of external impulſe or its own ſpontaneous energy, other bodies are ſuddenly brought into exiſtence: would it then acquire the idea of motion? it certainly would, from perceiving its own change of place with reſpect to thoſe bodies; and though at firſt it would not perhaps be able to determine whether itſelf or the bodies around it were moving, yet a little experience would decide this queſtion likewiſe, and convince it that the motion was the effect either of its own *mental energy*, or that external *impulſe* which it had felt before the other bodies were preſented to its view. But it is obvious, that the creation of new bodies at a diſtance, can make no real alteration in the ſtate of a body which had exiſted before them: and therefore, as this animated globe would now *perceive* itſelf to be moving, we may infer with the utmoſt certainty, that it *was moving* before; and that the motion of a ſingle body, though not *perceivable* by the ſenſes, might poſſibly be produced in empty ſpace.

193 Whether motion would be poſſible in ſpace abſolutely full?

Having thus ſeen that a ſingle body is capable of motion in empty ſpace, the next queſtion that occurs on this ſubject is, Whether it would be poſſible to move a body in ſpace that is abſolutely full? Such are the terms in which this queſtion is uſually put; and by being thus expreſſed, it has given riſe to the diſpute among natural philoſophers about the exiſtence of a *vacuum*. Perhaps the diſpute might have been avoided had the queſtion been more accurately ſtated. For inſtance, had it been aſked, Whether motion would be poſſible, could matter be ſuppoſed abſolutely infinite without any the leaſt interſtice or vacuity among its ſolid parts? we apprehend that every reflecting man would have anſwered in the negative. At any rate, the queſtion ought to be thus ſtated in metaphyſics; becauſe we have ſeen that ſpace, though a poſitive term, denotes nothing really exiſting. Now it being of the very eſſence of every ſolid ſubſtance to exclude from the place which it occupies every other ſolid ſubſtance, it follows undeniably, that not one particle of an infinite ſolid could be moved from its place without the previous annihilation of another particle of equal extent; but that annihilation would deſtroy the infinity. Were matter extended to any degree *leſs* than infinity, the motion of its parts would undoubtedly be poſſible, becauſe a ſufficient force could ſeparate thoſe parts and introduce among them vacuities of any extent; but without vacuities capable of containing the body to be moved, it is obvious that no force whatever could produce motion. This being the caſe it follows, that however far we ſuppoſe the material univerſe extended, there muſt be vacuities

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detur aliud corpus, cujus ſitu motus determinari intelligatur. Hujus ſententiæ veritas clariſſima elucebit, modo corporum omnium tam noſtri quam aliorum, præter globum iſtum unicum, annihilationem recte ſuppoſuerimus.

"Concipiantur porro duo globi, et præterea nihil corporeum exiſtere. Concipiantur deinde vires, quomodunque applicari: quidquid tandem per applicationem virium intelligamus, motus circularis duorum globorum circa commune centrum nequit per imaginationem concipi. Supponamus deinde cœlum fixarum creari: ſubito ex concepto appulſu globorum ad diverſas cœli iſtius partes motus concipietur. Scilicet cum motus natura ſua ſit relativus, concipi non potuit priuſquam darentur corpora correlata. Quemadmodum nec ulla relatio alia ſine correlatis concipi poteſt." *De Motu.*

vacuities in it ſufficient to permit the motion of the planets and all the other heavenly bodies, which we plainly perceive to revolve round a centre; and if ſo, the next queſtion to be determined is, What can *in vacuo* operate upon ſuch immenſe bodies, ſo as to produce a regular and continued motion?

194 Bodies equally indifferent to motion and reſt.

That all bodies are equally capable of motion or reſt, has by natural philoſophers been as completely proved as any thing can be proved by obſervation and experience. It is indeed a fact obvious to the moſt ſuperficial obſerver; for if either of theſe ſtates were eſſential to matter, the other would be abſolutely impoſſible. If reſt were eſſential, nothing could be moved; if motion were eſſential, nothing could be at reſt, but every the minuteſt atom would have a motion of its own, which is contrary to univerſal experience. With reſpect to motion and reſt, matter is wholly paſſive. No man ever perceived a body inanimated begin to move, or when in motion ſtop without reſiſtance. A billiard ball laid at reſt on the ſmootheſt ſurface, would continue at reſt to the end of time, unleſs moved by ſome force extrinſic to itſelf. If ſuch a ball were ſtruck by another ball, it would indeed be moved with a velocity proportioned to the impetus with which it was ſtruck; but the impelling ball would loſe as much of its own motion as was communicated to that upon which the impulſe was made. It is evident, therefore, that in this inſtance there is no *beginning* of motion, but only the communication of motion from one body to another; and we may ſtill aſk, Where had the motion its origin? If the impelling ball was thrown from the hand of a man, or ſtruck with a racket, it is plain that by a volition of the man's mind the motion was firſt given to his own arm, whence it proceeded through the racket from one ball to another; ſo that the ball, racket, and arm, were mere inſtruments, and the mind of the man the only agent or firſt mover. That motion can be *begun* by any being which is not poſſeſſed of life, conſciouſneſs, and will, or what is analogous to theſe, is to us altogether inconceivable. Mere matter or inanimated body can operate upon body only by impulſe: but impulſe, though from the poverty of language we are ſometimes obliged to talk of its agency, is itſelf merely an effect; for it is nothing more than the contact of two bodies, of which one at leaſt is in motion. An infinite ſeries of effects without a cauſe is the greateſt abſurdity; and therefore motion cannot have been communicated from eternity by the impulſe of body upon body, but muſt have been originally produced by a being who acts in a manner analogous to the energies of the human will.

195 [illegible]

But though motion could not have been begun but by the energy of mind, it is generally believed that it might be continued by the mere paſſivity of body; and it is a law of the Newtonian philoſophy, that a body projected in empty ſpace would continue to move in a ſtraight line for ever. The only reaſon which can be aſſigned for this law is, that ſince body continues to move at all after the impetus of projection has ceaſed, it could not of itſelf ceaſe to move without becoming active; becauſe as much force is required to ſtop a body in motion as to communicate motion to the ſame body at reſt. Many objections have been made to this argument, and to the law of which it is the foundation; but as we do not perceive their ſtrength, we ſhall not fill our page with a formal examination of them (R). If a ſingle body could exiſt and have motion communicated to it *in vacuo* by the force of projection, we are perſuaded, that from the very paſſivity of matter, that motion would never have an end; but it is obvious that it could be moved only in a ſtraight line, for an impulſe can be given in no other direction.

196 The Newtonian doctrine reſpecting the cauſes of the motion of the heavenly bodies.

The heavenly bodies, however, are not moved in ſtraight lines, but in curves round a centre; and therefore their motion cannot have been originally communicated merely by an impreſſed force of projection. This is admitted by all philoſophers, and therefore the Newtonians ſuppoſe that the planets are moved in elliptical orbits by the joint agency of two forces acting in different directions. One of theſe forces makes the planet tend directly to the centre about which it revolves; the other impels it to fly off in a tangent to the curve deſcribed. The former they call *gravitation*, which ſome of them have affirmed to be a property inherent in all matter; and the latter, which is a projectile force, they conſider as impreſſed *ab extra*. By the joint agency of ſuch forces, duly proportioned to each other, Sir Iſaac Newton has demonſtrated, that the planets muſt neceſſarily deſcribe ſuch orbits as by obſervation and experience they are found actually to deſcribe. But the queſtion with the metaphyſician is, Whether ſuch forces be real?

197 Mutual attraction among the heavenly bodies impoſſible.

With reſpect to projection, there is no difficulty; but that bodies ſhould mutually act upon each other at a diſtance, and through an immenſe vacuum, ſeems at firſt ſight altogether impoſſible. If the planets are moved by the forces of gravitation and projection, they muſt neceſſarily move *in vacuo*; for the continual

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(R) By much the ſtrongeſt and beſt urged of theſe objections which we have ſeen, is made by Dr Horſely, a man equally learned in mathematics and in ancient and modern philoſophy. "I believe with the author of Ancient Metaphyſics (ſays he), that ſome active principle is neceſſary for the continuance as well as for the beginning of motion. I know that many Newtonians will not allow this: I believe they are miſled, as I myſelf have formerly been miſled by the expreſſion *a ſtate of motion*. Motion is a change; a continuance of motion is a farther change; a farther change is a repeated effect; a repeated effect requires a repeating cauſe. State implies the contrary of change; and motion being change, a *ſtate of motion* is a contradiction in terms." See *Ancient Metaphyſics*, Vol. II.

If our readers think this reaſoning concluſive, they may be in the right; and in that caſe they will ſee the neceſſity of admitting, even for the continuance of rectilineal motion, the *plaſtic nature*, or ſomething equivalent to it, without which we have endeavoured to prove that the heavenly bodies could not revolve round their reſpective centres in elliptical curves.

reſiſtance of even the rareſt medium would in time overcome the force of the greateſt impetus: but if they move in vacuo, how can they be attracted by the ſun or by one another? It is a ſelf-evident truth, that nothing can act but where it is preſent, either immediately or mediately; becauſe every thing which operates upon another, muſt perform that operation either by its own immediate agency or by means of ſome inſtrument. The ſun and planets are not in contact; nor, if the motion of theſe bodies be *in vacuo*, can any thing material paſs as an inſtrument from the one to the other. We know indeed by experience, that every particle of unorganiſed matter within our reach has a tendency to move towards the centre of the earth; and we are intuitively certain, that ſuch a tendency muſt have ſome cauſe: but when we infer that cauſe to be a power of attraction inherent in all matter, which mutually acts upon bodies at a diſtance, drawing them towards each other, we talk a language which is perfectly unintelligible (s). Nay more, we may venture to affirm that ſuch an inference is contrary to fact. The particles of every elaſtic fluid fly *from* each other; the flame of a fire darts *upwards* with a velocity for which the weight of the circumambient air cannot account; and the motion of the particles of a plant when growing, is ſo far from tending toward the *centre* of the earth, that when a flowerpot is inverted, every vegetable in it, as ſoon as it is arrived at a ſufficient length, bends itſelf over the ſide of the pot, and grows with its top in the natural poſition.

198 The heavenly bodies cannot be moved by two forces impreſſed ab extra;

Senſible of the force of theſe arguments againſt the poſſibility of an attractive power in matter which operates at a diſtance, other philoſophers have ſuppoſed that the heavenly bodies are moved in elliptical orbits by means of two forces originally impreſſed upon each planet impelling it in different directions at the ſame time. But if the tendency of the planets towards the centre of the ſun be of the ſame kind with that of heavy bodies towards the centre of the earth (and if there be ſuch a tendency at all, we have no reaſon to ſuppoſe it different), it cannot poſſibly be the effect of impulſe. A body impelled or projected *in vacuo* would continue to be moved with an equable velocity, neither accelerated nor retarded as it approached the object towards which it was directed; but the velocity of a body tending towards the centre of the earth is continually accelerated: and as we cannot doubt but that the ſame thing takes place in the motion of a body tending towards the centre of the ſun, that motion cannot be the effect of impulſe or projection.

199 Nor by the agency of any material fluid.

Some of the Newtonians therefore have ſuppoſed, "That all kinds of attraction conſiſt in fine imperceptible particles or inviſible effluvia, which proceed from every point in the ſurface of the attracting body, in all right-lined directions every way; which in their progreſs lighting on other bodies, urge and ſolicit them towards the ſuperior attracting body; and therefore (ſay they) the force or intenſity of the attracting power in general muſt always decreaſe as the ſquares of the diſtances increaſe." The inference is fairly drawn from the fact, provided the fact itſelf were real or poſſible: but it is obvious, that if fine imperceptible particles or inviſible effluvia were thus iſſued from every point in the ſurface of the ſun, the earth and other planets could not move *in vacuo*; and therefore the projectile motion would in time be ſtopped by the reſiſtance of this powerful medium. Beſides, is it not altogether inconceivable, nay impoſſible, that particles iſſuing *from* the ſun ſhould draw the planets *towards* that centre? would they not rather of neceſſity drive them to a greater diſtance? To ſay, that after they have reached the planets, they change their motion and return to the place whence they ſet out, is to endue them with the powers of intelligence and will, and to transform them from paſſive matter to active mind.

(s) Since this article was finiſhed for the preſs, Profeſſor Stewart's *Elements of the Philoſophy of the Human Mind* have been given to the public; a work of which the merit is ſuch as to make it painful to us to differ in any important opinion from the ingenious author. We ſhall, however, claim the ſame liberty of diſſenting occaſionally from him that he has claimed of diſſenting from Newton, Locke, Clarke, and Cudworth, from whom he differs widely in thinking it as eaſy to conceive how bodies can act upon each other at a diſtance, as how one body can communicate motion to another by impulſe. "I allow (ſays he, p. 79), that it is impoſſible to conceive in what manner one body acts upon another at a diſtance through a vacuum; but I cannot admit that it removes the difficulty to ſuppoſe, that the two bodies are in actual contact. That one body may be the efficient cauſe of the motion of another body placed at a diſtance from it, I do by no means aſſert; but only that we have as good reaſon to believe that this may be poſſible, as to believe that any one natural event is the efficient cauſe of another."

If by *efficient* cauſe be here meant the *firſt* and *original* cauſe of motion, we have the honour to agree with the learned Profeſſor; for we are perſuaded that body inanimated is not, in this ſenſe of the word, the cauſe of motion either at hand or at a diſtance: but if he mean (and we think he muſt, becauſe ſuch was the meaning of Newton, from whom he profeſſes to differ), that we can as eaſily conceive one body to be the inſtrumental cauſe of the motion of another from which it is diſtant, as we can conceive it to communicate motion by impulſe, we cannot help thinking him greatly miſtaken. We will not indeed affirm, with the writer whom he quotes, "that although the experiment had never been made, the communication of motion by impulſe might have been predicted by reaſoning *à priori*;" becauſe we are not certain, that without ſome ſuch experiment we ſhould ever have acquired adequate notions of the ſolidity of matter: But if all corporeal ſubſtances be allowed to be ſolid and poſſeſſed of that negative power to which philoſophers have given the name of *vis inertiæ*, we think it may be eaſily proved *à priori*, that a ſufficient impulſe of one hard body upon another *muſt* communicate *motion* to that other; for when the *vis inertiæ*, by which alone the one body is kept in its place, is leſs than the *vis impetus* with which the other ruſhes to take poſſeſſion of that place, it is evident that the former body *muſt* give way to the latter, which it can do only by motion, otherwiſe the two bodies would occupy one and the ſame place, which is inconſiſtent with their ſolidity. But that a ſubſtance poſſeſſed of a *vis inertiæ* ſhould make another ſubſtance poſſeſſed of the ſame negative power quit a place to which itſelf has no *tendency*, is to us not only *inconceivable*, but apparently impoſſible, as implying a direct contradiction.

Theſe difficulties in the theories of attraction and impulſe have ſet philoſophers upon fabricating numberleſs hypotheſes: and Sir Iſaac Newton himſelf, who never conſidered gravitation as any thing more than an effect, conjectured that there might be a very ſubtle fluid or ether pervading all bodies, and producing not only the motion of the planets, and the fall of heavy bodies to the earth, but even the mechanical part of muſcular motion and ſenſation. Others (T) again have ſuppoſed fire, or light, or the electric fluid, to be the univerſal agent; and ſome few (U) have acknowledged, that nothing is ſufficient to produce the phenomena but the immediate agency of mind.

With reſpect to the interpoſition of any material fluid, whether ether, fire, light, or electricity, it is ſufficient to ſay that it does not remove any one difficulty which encumbers the theory of innate attraction. All theſe fluids are elaſtic; and of courſe the particles of which they are compoſed are diſtant from each other. Whatever motion, therefore, we may ſuppoſe to be given to one particle or ſet of particles, the queſtion ſtill recurs. How is it communicated from them to others? If one body can act upon another at the diſtance of the ten-thouſandth part of an inch, we can perceive nothing to hinder its action from extending to the diſtance of ten thouſand millions of miles. In the one caſe as well as the other, the body is acting where it is not preſent; and if that be admitted to be poſſible, all our notions of action are ſubverted, and it is vain to reaſon about the cauſe of any phenomenon in nature.

200 The hypotheſis of Plato, Ariſtotle, and Cudworth.

This theory of the intermediate agency of a ſubtle fluid differs not eſſentially from the vortices of Des Cartes; which appeared ſo very abſurd to Cudworth, that with a boldneſs becoming a man of the firſt genius and learning, he rejected it, and adopted the plaſtic nature of Plato, Ariſtotle, and other Greek philoſophers. That incomparable ſcholar obſerves, that matter being purely paſſive, the motion of the heavenly bodies, the growth of vegetables, and even the formation of animal bodies, muſt be the effect either of the immediate agency of God, or the agency of a *plaſtic nature* uſed as an inſtrument by divine wiſdom. That they are not the effects of God's immediate agency he thinks obvious from ſeveral circumſtances. In the firſt place, they are performed ſlowly and by degrees, which is not ſuitable to our notions of the agency of almighty Power. Secondly, Many blunders are committed in the operations of nature, ſuch as the formation of monſters, &c. which could never be were things formed by the immediate hand of God. He is therefore of opinion, that, after the creation of matter, God employed an inferior agent to give it motion and form, and to carry on all thoſe operations which have been continued in it ſince the beginning of the world. This agent he calls *plaſtic nature*; and conſiders it as a being incorporeal, which penetrates the moſt ſolid ſubſtance, and, in a manner which he pretends not to explain otherwiſe than by analogy, actuates the univerſe. He does not look upon it as a being endued with perception, conſciouſneſs, or intelligence; but merely as an inſtrument which acts under divine wiſdom according to certain laws. He compares it to art embodied; and quoting from Ariſtotle, ſays, Ει ενην εν τω ξυλω η ναυπηγικη ὁμοιως αν τη φυσει εποιει. *If the art of ship-wright were in the timber itſelf, operatively and effectually, it would there act juſt as nature doth.* He calls it a certain lower life than the animal, which acts regularly and artificially for ends of which it knows nothing. It may be, he ſays, either a lower faculty of ſome conſcious ſoul, or elſe an inferior kind of life or ſoul by itſelf, but depending in either caſe upon a higher intellect. He is aware with what difficulty ſuch a principle will be admitted by thoſe philoſophers who have divided all being into ſuch as is extended and ſuch as is cogitative: but he thinks this diviſion improper. He would divide beings into thoſe which are ſolid and extended, and thoſe which have life or internal energy. Thoſe beings which have life or internal energy he would again divide into ſuch as act with conſciouſneſs, and ſuch as act without it: the latter of which is this plaſtic life of nature. To prove that ſuch an inſtrument is poſſible, or that a being may be capable of operating for ends of which it knows nothing, he inſtances *bees* and other animals, who are impelled by *inſtinct* to do many things neceſſary to their own preſervation, without having the leaſt notion of the purpoſe for which they work. (See INSTINCT.) He obſerves, that there is an eſſential difference between reaſon and inſtinct, though they are both the attributes of mind or incorporeal ſubſtance: and that therefore, as we know of two kinds of mind differing ſo widely, there is nothing to hinder us from inferring a third, with powers differing as much from inſtinct as inſtinct differs from reaſon. Mankind are *conſcious* of their own operations, *know* for what *purpoſe* they generally act, and can by the power of *reflection* take a *retroſpective* view of their actions and thoughts, making as it were the mind its own object. Brutes are *conſcious* of their own operations, but they are ignorant of the *purpoſes* for which they operate, and altogether *incapable* of *reflecting* either upon their paſt conduct or paſt thoughts. Between their intellectual powers and thoſe of man, there is a much greater difference than there is between them and a plaſtic nature, which acts as an inſtrument of divine wiſdom without any conſciouſneſs of its own operations. Ariſtotle, from whom principally the

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(T) The ſeveral followers of Mr Hutchinſon.

(U) Cudworth, Berkeley, and the author of Ancient Metaphyſics.

the learned author takes his notion of this plaſtic nature, compares it, with reſpect to the divine Wiſdom which directs and ſuperintends its operations, to a mere builder or mechanic working under an architect, for the purpoſe of which the mechanic himſelf knows nothing. The words of the Stagyrite are: Τους αρχιτεκτονας περι ἑκαστον τιμιωτερους και μαλλον ειδεναι νομιζομεν των χειροτεχνων, και σοφωτερους ὁτι τας αιτιας των ποιουμενων ισασιν· οἱ δ' ὡσπερ και των αψυχων ενια, ποιει μεν, ουκ ειδοτα δε ποιει ἃ ποιει, οἱον καιει το πυρ· τα μεν ουν αψυχα φυσει τινι ποιειν τουτων ἑκαστον, τους δε χειροτεχνας δι' εθος *. "We account the architects in every thing more honourable than the mere workmen, becauſe they underſtand the reaſon of the things done; whereas the other, as ſome inanimate things, only work, not knowing what they do, juſt as the fire burns: the difference between them being only this, that inanimate things act by a certain nature in them, but the workman by habit."

* Metaphy. Lib. i. cap. I.

201 Shown to be poſſible.

Still farther to prove that a being may be endowed with ſome vital energy of a ſubordinate kind, and yet be deſtitute of conſciouſneſs and perception, the learned author obſerves, that there is no reaſon to think that the ſouls of men in ſound ſleep, lethargies, or apoplexies, are conſcious of any thing; and far leſs, it poſſible to ſuppoſe that the ſouls of embryos in the womb are from the very firſt moment of their arrival there intelligent and conſcious beings: neither can we ſay, how we come to be ſo differently affected in our ſouls by the different motions made upon our bodies, nor are we conſcious always of thoſe energies by which we impreſs phantaſtic ideas on the imagination. But if it be poſſible for the ſouls of men to be for one inſtant void of conſciouſneſs and intelligence, it follows, that conſciouſneſs is not abſolutely neceſſary to thoſe energies and motions by which life is preſerved. To this it may be added, upon the beſt authority ‡, "that where animal or vegetable life is concerned, there is in every caſe a different relation between the cauſe and effect, and ſeemingly depending upon the concurrence or influence of ſome farther principle of change in the ſubject, than what ſubſiſts in inanimate matter, or in the cauſes and effects that are the objects of mechanical and chemical philoſophy." Now to this principle of vegetable life, without which, in a ſeed or in a plant, vegetation will neither begin nor continue, though light, heat, air, earth, and water, ſhould concur in the utmoſt perfection, Cudworth expreſsly compares his plaſtic nature in the univerſe. It is ſo far (ſays he) from being the firſt or higheſt life, that it is indeed the laſt and loweſt of all lives, being really the ſame thing with the vegetative.

‡ Gregory's Philoſophical and Literary Eſſays.

202 Arguments for its truth: but

Theſe arguments, if the phenomena of elective attractions in chemiſtry be added to them, demonſtrate, we think, the *poſſibility* of ſuch a principle; and to thoſe who are inclined to affirm that no ſuch thing can exiſt, becauſe, according to the deſcription of it given by Cudworth and the ancients, it is neither body nor ſpirit, in the proper ſenſe of the words; we beg leave to aſk in the words of Locke, "Who told them that there is and can be nothing but ſolid beings which cannot think, and thinking beings that are not extended? which is all that they mean by the terms body and ſpirit." All the Greek philoſophers who were not materialiſts, and even the inſpired writers of the Old and New Teſtaments, conſtantly diſtinguiſh between the *ſpirit* and the *ſoul*, of a man calling the former ſometimes νους and ſometimes πνευμα, and the latter ψυχη; and St Paul, who before he was a Chriſtian was learned in philoſophy, deſcribes the conſtituent parts of man as three, πνευμα, ψυχη, σωμα, *ſpirit*, *ſoul*, and *body*. This diſtinction, ſetting aſide the *authority*, with which it comes to us, ſeems to be well founded; for there are many operations carried on in the human body without any conſcious exertion of ours, and which yet cannot be accounted for by the laws of mechaniſm. Of theſe, Cudworth inſtances the motion of the diaphragm and other muſcles which cauſes reſpiration, and the ſyſtole and diaſtole of the heart: neither of which, he thinks, can be the effect of mere mechaniſm. But, as we are not conſcious of any energy of ſoul from which they proceed, even while we are awake, and ſtill leſs, if poſſible, while we are aſleep; he attributes them, not to the intellect or rational mind, but to this inferior vital principle called ψυχη (v); which, in his opinion, acts the

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(v) The exiſtence of this plaſtic nature was warmly debated between Monſieur Le Clerc and Monſieur Bayle. Moſheim, who was inclined himſelf to admit ſuch a principle, gives the following view of Le Clerc's ſentiments from *Bibliotheque choiſie*, tom. ii. p. 113. "Reſpiratio inquit, et motus cordis, actiones ſunt, quorum nihil ad animam pertinet. Interim mechanice eas fieri, nullo modo probabile eſt. In voluntariis commotionibus neſciunt animi noſtri, quid facto opus ſit, ut membra commoveantur: imperant illi tantum. Eſt vero aliud neſcio quid, quod fideliter, ſi modo organa recte ſint affecta, mandata ejus exſequitur. Quidni igitur ſuſpicemur, eſſe *naturam* in corpore noſtro *viventem*, præter animam noſtram, cujus ſit animæ præceptis et juſſis morem gerere? quamquam potentia ejus ita ſit definita, ut obedire nequeat animo, niſi recte ſeſe habeant organa. Eadem forte natura, corporis noſtri motibus impulſa, animam edocet, quid factum ſit, ut ille poſſit præcipere, quæ ad conſervationem corporis neceſſaria judicat. Anima, pergit, ſi hæc vera eſſe putes, ſimilis erit domino, ſibimet ipſi ſervire neſcio, nec ulla facultate alia, quam imperandi et jubendi inſtructo. Hæc vero natura fictrix non diſſimilis erit mancipii cui nihil eorum, quæ dominus meditatur, notum eſt, quodque nihil aliud facit, quam ut juſſis pareat, et dominum de illis rebus admoneat, quæ ad ſalutem ipſius pertinent." Moſheim proceeds,—Si quis huic loco ſic occurrat, Hæc ratione tria fingi in homine principia; reſpondet vir doctus; "Nullis conſtaris argumentis, binis tantum hominem partibus conſtare. Eos, qui hominem ex binis tantum partibus component, nulla ratione explicare poſſe naturam conjunctionis animi et corporis, niſi ipſum Deum ſtatuant cunctis actionibus hominum intervenire: hoc vero Divina Majeſtate prorſus indignum eſſe. Definitionem accuratam mediæ hujus naturæ poſtulantibus ſeſe talem dare non poſſe definitionem reſpondet: Hoc unum ſeſe ſcire: eſſe eam naturam interiori agendi virtute inſtructam, quæ et ſe et animam et corpus afficere queat: naturam, quæ doceat animam quid rerum

Of Motion.

the ſame part in the ſyſtem of the human body which the plaſtic nature acts in the ſyſtem of the world.— To make the reſemblance more ſtriking, he obſerves, that even the voluntary motion of our limbs, though it proceeds ultimately from an energy of will, ſeems to be the effect of that energy employing ſome *inſtrument* which pervades the ſinews, nerves, and muſcles of the body; and if the human ſpirit or *πνευμα* employ the inſtrumentality of a plaſtic nature or [illegible] in moving the ſmall machine of the body, it ſeems to be far from incredible that the Divine Wiſdom ſhould employ the inſtrumentality of a plaſtic nature in moving the great machine of the univerſe.

203 Whether it be true or not, the motions of the heavenly bodies are carried on by the conſtant agency of ſomething incorporeal.

But we need not inſiſt further on the *poſſibility* of ſuch an inſtrument. Whatever may be thought of the arguments of Cudworth, of which ſome are, to ſay the leaſt of them, plauſible, though others appear to us to have very little ſtrength, Dr Clarke has proved, with a force of reaſoning not inferior to mathematical demonſtration, that the motions of the heavenly bodies are carried on by the agency of ſomething very different from matter, under every poſſible form. "For not to ſay that, ſeeing matter is utterly incapable of obeying any *laws* in the proper ſenſe of the word, the very original laws of motion themſelves cannot continue to take place, but by ſomething ſuperior to matter, *continually* exerting on it a certain force or power according to ſuch certain and determinate laws; it is now evident beyond queſtion, that the bodies of all *plants* and *animals* could not poſſibly have been formed by mere matter according to any general laws of motion. And not only ſo, but that moſt univerſal principle of *gravitation* itſelf, the ſpring of almoſt all the great and regular inanimate motions in the world, as depending not at all the *ſurfaces* of bodies, by which alone they can act upon one another, but entirely to their *ſolid contents*, cannot poſſibly be the reſult of any motion originally impreſſed upon matter." For though it is true, that the moſt ſolid bodies with which we are acquainted are all very porous; and that, therefore, a ſubtile material fluid might penetrate the bodies of the planets, and operate upon them with a force exerted internally; ſtill it is ſelf-evident, that the *greateſt* quantities of ſuch a fluid could not enter into thoſe bodies which are *leaſt* porous, and where the greateſt force of *gravitation* reſides: "and, therefore, this motion muſt of neceſſity be cauſed by ſomething which penetrates the very *ſolid ſubſtance* of all bodies, and continually puts forth in them a force or power entirely different from that by which matter acts upon matter †." Which is, as the ſame able writer obſerves, an evident demonſtration, not only of the world's being originally made by a ſupreme intelligent Cauſe; but moreover that it depends every moment upon ſome ſuperior Being, for the preſervation of its frame; and that all the great motions in it are cauſed by ſome immaterial power *perpetually* and *actually* exerting itſelf every moment in every part of the corporeal univerſe. This preſerving and governing power, whether it be the immediate power and action of the ſame Supreme Cauſe that created the world, or the action of ſome ſubordinate inſtruments appointed by him to direct and preſide reſpectively over certain parts thereof, gives us equally in either way a very noble idea of Providence. We know with certainty, that *real* and *original power* can belong only to a being endowed with intelligence and will; and, therefore, if the exiſtence of Cudworth's (w) plaſtic nature be

† Evidence of Natural and Revealed Religion.

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rerum geratur in corpore; naturam denique, quæ animi mandatis, quorum tamen cauſſas neſciat, fideliter obtemperet." Reliqua, quæ illuſtrandæ hujus rei cauſſa Clericus affert, prætereo. Satis copioſa eſt in illis, quæ produximus, meditandi materia. *Moſheim. ed. Syſt. Intellect.* p. 173.

Such a principle actuating the univerſe, if it be diveſted of intelligence, and conſidered as a ſecond or inferior cauſe, under the direction of the Supreme, is acknowledged by a very able judge to be a rational hypotheſis; and ſuch, if properly purſued, would certainly open a moſt entertaining ſcene of natural philoſophy. See *Jones's Anſwer to an Eſſay on Spirit.*

(w) Beſides Cudworth, we have mentioned Berkeley and the author of *Ancient Metaphyſics*, as holding all motion to be an effect of the immediate agency of mind or incorporeal ſubſtance. The opinion of the laſt of theſe philoſophers is not eſſentially different from Cudworth's; and therefore it is needleſs to quote from him: Berkeley was better acquainted with the principles of the Newtonian philoſophy, as well as an abler mathematician, than either of theſe pupils of the ancients; and being likewiſe a man who on all ſubjects thought for himſelf, it may be worth while to lay before our rerders a ſhort abſtract of his reaſoning reſpecting the origin of motion. His words are: "Totum id quod novimus, cui nomen *corpus* indidimus, nihil in ſe continet quod motus principium ſeu cauſa efficiens eſſe poſſit. *Vis*, *gravitas*, *attractio*, et hujuſmodi voces, utiles ſunt ad ratiocinia et computationes de motu et corporibus motis; ſed non ad intelligendam ſimplicem ipſius motus naturam, vel ad qualitates totidem diſtinctas deſignandas. Attractionem certe quod attinet, patet illam ab Newtono adhiberi, non tanquam qualitatem veram et phyſicam, ſed ſolummodo ut hypotheſin mathematicam. Quin et Leibnitius, niſum elementarem ſeu ſolicitationem ab impetu diſtinguens, fatetur illa entia non re ipſa inveniri in rerum natura, ſed abſtractione facienda eſſe. Similis ratio eſt compoſitionis et reſolutionis virium quarumcunque directarum in quaſcunque obliquas, per diagonalem et latera parallelogrammi. Hæc mechanices et computationi inſerviunt: ſed aliud eſt computationi et demonſtrationibus mathematicis inſervire, aliud rerum naturam exhibere. Revera corpus æque perſeverat in utrovis ſtatu, vel motus vel quietis. Iſta vero perſeverantia non magis dicenda eſt actio corporis, quam exiſtentia ejuſdem actio diceretur. Cæterum reſiſtentiam, quam experimur in ſiſtendo corpore moto, ejus actionem eſſe fingimus vana ſpecie deluſi. Revera enim iſta reſiſtentia quam ſentimus, paſſio eſt in nobis, neque arguit corpus agere, ſed nos pati: conſtat utique nos idem paſſuros fuiſſe, ſive corpus illud a ſe moveatur, ſive ab alio principio impellatur.—Actio et reactio dicuntur eſſe in corporibus: nec incommode ad demonſtrationes mechanicas. Sed cavendum, ne propterea ſuppe-

be admitted, (and we ſee not (x) why it ſhould be called in queſtion), it can be conſidered only as an inſtrument employed by Divine Wiſdom, as a chizzel or a ſaw is employed by the wiſdom of the mechanic.

204 This theory not inconſiſtent with the principle of Newton.

Nor let it be imagined, that this ancient theory of motion is in any degree inconſiſtent with the mathematical principles of Sir Iſaac Newton's aſtronomy, or with the calculations raiſed from thoſe principles. Having founded his aſtronomy on analogy between the phænomena of projectile and planetary motions, he aſſigned the ſame or ſimilar *forces* exiſting in nature as the efficient cauſes of both. And indeed, both in the act of deriving his *principles* from the projectile phenomena, and afterwards for the purpoſe of applying them to the planetary, it was neceſſary to analyze the elliptical motion of the heavenly bodies into a compound or two ſimple motions in right lines, produced by the action of theſe different forces; and this might alſo be uſeful for the purpoſes of teaching and demonſtration, juſt as we find it neceſſary, in all parts of ſcience, to ſeparate what in nature is inſeparable, for the convenience and aſſiſtance of the underſtanding. The planetary motions, however, are very probably ſimple and uncompounded, for no experiments can be tried in thoſe diſtant regions; and the aſtronomy of Newton, which is only the application of his mathematical principles to their menſuration from their *analogy* to projectile motions, does not at all require that the forces of gravitation and projection be aſſigned as their real exiſtent cauſes (y). It is ſufficient for the *analogy*, on which the whole philoſophy is founded, that the phenomena of motion are known from experiments and obſervations to be the *ſame* in *both* inſtances; that the *principles* or *general laws* mathematically eſtabliſhed from the *forces* of the *one* are transferred to the *phenomena* of the *other*; and that the proofs and operations deduced from theſe principles in the latter caſe, are confirmed by *facts* and *experience*, the firſt and final teſt of truth. *

CHAP. VI. *Of* NUMBER.

205 Unity, as an idea, cannot

"AMONGST all the ideas that we have, as there is none (ſays Mr Locke ‡) ſuggeſted to the mind by more ways, ſo there is none more ſimple than that of UNITY or one. It has no ſhadow of variety or compoſition in it. Every object our ſenſes are employed about, every idea in our underſtandings, every thought of our minds, brings this idea along with it: and therefore it is the moſt intimate to our thoughts, as well as it is, in its agreement to all other things, the moſt univerſal idea we have; or number applies itſelf to men, angels, actions, thoughts, every thing that either doth exiſt or can be imagined. "He ſeems likewiſe to be of opinion that we have the idea of *unity* before that of *many*; and that it is by repeating the ſimple idea of unity in our own minds that we come by the *complex ideas* of *two*, *three*, &c." In this opinion he is joined by Pere Buffier *; who obſerves that it is impoſſible to explain the nature of *unity*, becauſe it is the moſt ſimple idea, and that which perhaps *firſt* occurred to the mind.

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* Tatham's Chart and Scale of Truth.

‡ Eſſay, Book ii. chap. 16.

ſupponamus virtutem aliquam realem, quæ motus cauſa ſive principium ſit, eſſe in iis. Etenim voces illæ eodem modo intelligendæ ſunt ac vox *attractio*: et quemadmodum hæc eſt hypotheſis ſolummodo mathematica, non autem qualitas phyſica; idem etiam de illis intelligi debet, et ob eandem rationem.

"Auferantur ex idea corporis extenſio, ſoliditas, figura, remanebit nihil. Sed qualitates iſtæ ſunt ad motum indifferentes, nec in ſe quidquam habent, quod motus principium dici poſſit. Hoc ex ipſis ideis noſtris perſpicuum eſt. Si igitur voce *corpus* ſignificatur id quod concipimus, plane conſtat inde non peti poſſe principium motus: pars ſcilicet nulla aut attributum illus cauſa efficiens vera eſt, quæ motum producat. Vocem autem proferre, et nihil concipere, id demum indignum eſſet philoſopho.

"Præter res corporeas, alterum eſt genus rerum cogitantium: in iis autem potentiam ineſſe corpora movendi, propria experientia didicimus, quando quidem anima noſtra pro lubitu poſſit ciere et ſiſtere membrorum motus, quacunque tandem ratione id fiat. Hoc certe conſtat, corpora moveri ad nutum animæ, eamque proinde haud inepte dici poſſe principium motus; particulare quidem et ſubordinatum, quodque ipſum dependeat, a primo et univerſali principio.

"Ex dictis manifeſtum eſt eos qui vim activam, actionem, motus principium, in corporibus revera ineſſe affirmant, ſententiam nulla experientia fundatam amplecti, eamque terminis obſcuris et generalibus adſtruere, nec quid ſibi velint ſatis intelligere. E contrario, qui mentem eſſe principium motus volunt, ſententiam propria experientia munitam preferunt, hominumque omni ævo doctiſſimorum ſuffragiis comprobatam.

"Primus Anaxagoras τον νουν introduxit, qui motum inerti materiæ imprimeret: quam quidem ſententiam probat etiam Ariſtoteles, pluribuſque confirmat, aperte pronuncians primum movens eſſe immobile, indiviſibile, et nullum habens magnitudinem Dicere autem, omne motivum eſſe mobile, recte animadvertit idem eſſe ac ſiquis diceret, omne ædificativum eſſe ædificabile Plato inſuper in Timæo tradit machinam hanc corpoream, ſeu mundum viſibilem, agitari et animari a mente, quæ ſenſum omnem fugiat. Et Newtonus paſſim nec obſcure innuit, non ſolummodo motum ab initio a numine profectum eſſe, verum adhuc ſyſtema mundanum ab eodem actu moveri. Hoc ſacris literis conſonum eſt: hoc ſcholaſticorum calculo comprobatur."

De Motu, paſſim.

(x) This we ſay upon the received opinion, that there are beings wholly incorporeal. The truth of the opinion itſelf will be conſidered in a ſubſequent chapter.

(y) Indeed Sir Iſaac himſelf is very far from poſitively aſſigning them as the *real* cauſes of phenomena. The purpoſe for which they were introduced into his philoſophy he clearly explains in the following words; "Eadem ratione qua projectile vi gravitatis in orbem flecti poſſet et terram totam circumire, poteſt et luna, vel vi gravitatis, *ſi modo gravis ſit*, vel alia quacunque vi qua in terram urgeatur, retrahi ſemper a curſu rectilineo terram verſus et in orbem ſuum flecti: et abſque tali vi luna in orbe ſuo retineri non poteſt. Hæc vis, ſi *juſto minor* eſſet, non ſatis flecteret lunam a curſu rectilineo: ſi *juſto major*, plus ſatis flecteret, ac de orbe terram verſus deduceret. Requiritur quippe ut ſit *juſtæ magnitudinis*: et mathematicorum eſt invenire vim, qua corpus in dato quovis orbe data cum velocitate accurate retineri poſſit; et viciſſim invenire viam curvilineam, in quam corpus e dato quovis loco data cum velocitate egreſſum data vi flectatur."——*Principia Mathem.* Def. V.

206 be abſtracted from every individual.

That *unity* is a ſimple idea, muſt be granted; but it certainly did not firſt occur to the mind, nor can it be abſtracted from all individuals, and apprehended in Locke's ſenſe of the word as a *general idea*. Let any man look into his own mind, and then ſay whether he has a general idea of *one* or *unity* as abſtracted from every individual object mental and corporeal. In particular, when he thinks he has completely abſtracted it from body and mind, ſenſations, ideas, actions, and paſſions, &c. let him be ſure, before he pronounce it a general *abſtract* idea, that he is not all the while contemplating the idea of its *name*, or of that numerical *figure* by which it is marked in the operations of arithmetic. Both theſe ideas are in themſelves particular; and become general in their import, only as repreſenting every individual object to which unity is in any ſenſe applicable. But in the chapter *of abſtraction*, we have ſaid enough to convince every perſon capable of conviction that they are uſed as ſigns for whole claſſes of objects.

207 Unity, a particular relation.

Inſtead of being an abſtract general idea, *unity*, as the baſis of number, is in fact nothing but a mere *relation*, which cannot be conceived without the related objects; and ſo far is it from being the *firſt* idea that occurred to the mind, that it is certainly the reſult of a compariſon, made by the intellect, of two or more objects The ideas which firſt occur to the mind are, beyond all doubt, thoſe which are called *ideas of ſenſation*; and many ſuch ideas every child receives before he is capable of comparing objects and forming to himſelf notions of number. *Unity*, or the idea of *one*, is indeed the element of the ſcience of *arithmetic*, juſt as a mathematical *point* is the element of the ſcience of *geometry*; but accurate notions of theſe elements are, in the progreſs of knowledge, ſubſequent to ideas of *many* and of *ſurfaces*. There is reaſon to believe that perſons totally illiterate have no notion at all of *mathematical points*; and we think it poſſible to conceive an intelligent and conſcious being in ſuch a ſituation as that he could not acquire a notion of *unity* or *one*. Were a child never to ſee or feel two objects of the *ſame kind*, we doubt if he would think of numbering them, or of making ſuch a compariſon of the one with the other as would ſuggeſt to his mind the relations of *one* and *two*; for theſe relations imply both a ſameneſs and a difference of the objects beyond the power of a child to aſcertain. The difference indeed would be perceptible to the ſenſes, but the ſenſes would perceive no ſameneſs or agreement. A guinea, a ſhilling, and a ball of lead, impreſs upon the mind different ſenſations; and therefore a child undoubtedly diſtinguiſhes theſe objects from one another: but what could make him derive from them his firſt idea of the relation of number? A guinea, a ſhilling, and a ball of lead, are not *one*, *two*, *three*, in any ſenſe which a child can comprehend. To be convinced of this, let any man throw a guinea, a ſhilling, and a ball of lead upon a table, and aſk a *clown* what is their number. From being accuſtomed to retail the *names* of number as ſigns, without affixing to them any idea of the things ſignified, he will probably anſwer with quickneſs *three*, or perhaps *one*, *two*, *three*: but if he be further aſked in what *reſpect* they are *one*, *two*, *three*, we believe his anſwer will not be ſo ready: They are not *one*, *two*, *three guineas*, or *ſhillings*, or *balls of lead*. A philoſopher knows them to be three pieces of the ſame firſt matter under different forms, and can therefore apply to them the relation of number with truth and propriety; but of the firſt matter a *clown* is entirely ignorant, and of courſe cannot call them *one*, *two*, *three*, in any ſenſe which is at once true and to him intelligible.

To make it ſtill more evident, that it is only by comparing together things of the *ſame kind* that our *firſt* ideas of unity and number are formed, let us ſuppoſe no created being to have hitherto exiſted except the animated and intelligent globe mentioned in the laſt chapter, and we think it will be granted that ſuch a being in ſolitude could never acquire the idea of *unity*. Let us next ſuppoſe a *cubical* body to be created and exhibited to the ſenſes of this ſpherical man; the conſequence would be a *ſenſation* or feeling entirely new: but that feeling would not be of *unity*; for, as the author of *Ancient Metaphyſics* has ſomewhere well obſerved, unity is no object of ſenſation. The ſenſation would be of colour, hardneſs, ſoftneſs, roughneſs or ſmoothneſs, &c. for beyond theſe the empire of the ſenſes does not reach. Again, let another body be created of a colour and figure totally different from the colour and figure of the cube, and the ſpherical man would then experience new ſenſations having no agreement with thoſe which he had formerly felt. Theſe different kinds of ſenſations might be compared together; but the reſult of the compariſon would not be the ideas which are denoted by the words *one* and *two*, but merely that which is expreſſed by *difference* or *diſſimilarity*. Were another cube, however, of exactly the ſame ſize and colour with the former to be brought into exiſtence, and both to be at once preſented to the view of the ſpherical man, the rudiments of the idea of number would then be generated in his mind, becauſe he could not but perceive the cubes to be in one reſpect different and in another the ſame; different as being diſtinct from each other, and agreeing in their effects upon the organs of ſenſation.

208 Men muſt have made ſome progreſs in claſſing things according to genera and ſpecies, before they acquired any notion of number.

It appears, therefore, that mankind muſt have made ſome progreſs in claſſing things according to their genera and ſpecies, before they acquired any correct ideas of the relation of number, or thought of uſing numerical names or figures as general and diſcriminating ſigns: for we ſay *one*, *two*, *three*, &c. only with reſpect to the ſpecies or genus of which each of the things denoted by theſe numbers is an individual; and if there be any thing which has no genus or ſpecies, neither number nor unity can, in the original ſenſe of the words, be predicated of it (z). We ſay indeed that there is *one* God, but perhaps we do not always attend to the meaning of the expreſſion. Language was formed to anſwer the common purpoſes of life; and thoſe purpoſes are beſt anſwered by denoting individuals by the name of the ſpecies or genus to which they belong: but *God* belongs to no ſpecies or genus, unleſs he be ſaid improperly (A) to be of the univerſal genus of *Being;* and therefore the true meaning of the word *one*, when joined to the verb *is*, and transferred from the creature to the Creator, in ſuch a ſentence as—"there *is one* God"—ſeems to be nothing more than an affirmation that God exiſts, and that to him the relation of number cannot be applied. In a word, *unity* and *number* are merely relations between the individuals of the ſame ſpecies or genus of being; and men acquire ideas of theſe relations at the ſame time and by the ſame means that they are led to claſs things into ſpecies and genera. As to the proceſſes of addition and ſubtraction, and the various purpoſes to which number is applied, theſe things belong to the ſcience of arithmetic, and fall not under the province of the metaphyſician, whoſe ſole object is to aſcertain the real nature and cauſes of things. It may, however, be worth while to obſerve, that Locke, whoſe notions of number ſeem to have been different from ours, owns, that a man can hardly have any ideas of numbers of which his language does not furniſh him with names. But if units were either real things, or even poſitive ideas, we ſee not how *names* could be neceſſary to their exiſtence; whereas, if they be nothing more than mere relations, it is obvious that they cannot be conceived but as relative either to beings actually exiſting, or to names which are the ſigns of actual beings.

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* Firſt Truths.

CHAP. VII. *Of* TIME.

209
Time, a mode of duration in contradiſtinction to eternity.

WHEN St Auguſtine was aſked what time is? he replied, "*Si non roges, intelligo.*" An anſwer from which it may be inferred, that he thought the nature of *time* could not be explained by a logical definition. *Time* and *eternity* are commonly conſidered as the two modes of *duration;* and if duration be taken in what Locke thinks its true and original ſenſe, to denote permanence of exiſtence with a kind of reſiſtance to any deſtructive force, the diſtinction ſeems to be ſufficiently proper. It is indeed the beſt that we can make or comprehend; for *duration, time*, and *eternity*, are ſubjects which have perplexed philoſophical minds in all ages, and of which if we have adequate notions, it is very difficult to expreſs theſe notions in language. Inſtead of attempting it by previous definitions, the method in which the ancients generally began their inquiries, we ſhall purſue the better courſe of induction recommended by Lord Bacon, and endeavour to ſhow by what means we acquire the notion of that mode of duration which is called *time* in contradiſtinction to *eternity*. We begin with time; becauſe we ourſelves exiſt in it, and it is in ſome ſenſe familiar to us. If we be able to trace our notions of this mode of duration to their ſource, we may then give a definition of it founded on fact and univerſal experience, and afterwards proceed to conſider the other mode in conjunction with infinity, to which it is nearly allied.

It has been already obſerved (ſee n° 93 of this article), that every man, while awake, has a train of ſenſations and ideas conſtantly paſſing through his mind, in ſuch a manner as that the one ſucceeds the other in a regular order. It is not poſſible, either, by detaining in the mind one idea to the excluſion of all others, to ſtop the courſe of this ſucceſſion entirely; or, by hurrying ſome ideas off the ſtage, and calling others in their place, to quicken its progreſs beyond a certain degree. One man indeed has naturally a quicker ſucceſſion of ideas than another; and all men can, by great exertions, accelerate or retard in a ſmall degree the natural flow of their thoughts. A ſtudious man lays hold, as it were, of a particular idea, which he wiſhes to contemplate, and detains it in the imagination, to the excluſion of all others; a man of wit calls remote ideas into view with a rapidity of which a cool and phlegmatic reaſoner can form no conception; and a forcible *ſenſation* takes full poſſeſſion of the mind, to the excluſion of all *ideas* whatever. Whilſt the attention is wholly occupied by one idea, or by one ſenſation, the mind has no notion whatever of time; and were it poſſible to detain ſuch idea or ſenſation alone in the mind till the hand of a clock ſhould move from the number of one hour to that of another, the hour, as marked on the dial-plate and meaſured by the motion of the hand, would appear but as one inſtant abſolutely void of duration. For the truth of this aſſertion we appeal to the experience of our readers. Such of them as have ever been engaged in deep ſtudy muſt often have had their attention

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Whilſt the mind is occupied by one idea or notion, there is no perception of time; which

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(z) We are happy to find our notions on this ſubject confirmed by an authority ſo reſpectable as that of Profeſſor Stewart. "Without the power of attending ſeparately to things which our ſenſes preſent to us in a ſtate of union, we never (ſays this able writer) could have had any idea of *number:* for before we can conſider different objects as forming a multitude, it is neceſſary that we ſhould be able to apply to all of them one common name; or, in other words, that we ſhould reduce them all to the ſame genus. The various objects, for example, animate and inanimate, which are at this moment before me, I may claſs and number in a variety of different ways, according to the view of them that I chooſe to take. I may reckon ſucceſſively the number of ſheep, of cows, of horſes, of elms, of oaks, of beeches; or I may firſt reckon the number of animals, and then the number of trees; or, I may at once reckon the number of all the organized ſubſtances which my ſenſes preſent to me. But whatever be the principle on which my claſſification proceeds, it is evident that the objects numbered together muſt be conſidered in thoſe reſpects only in which they agree with each other; and that if I had no power of ſeparating the combinations of ſenſe, I never could have conceived them as forming a plurality." *Elements of the Philoſophy of the Human Mind*, chap. iv.

(A) We ſay *improperly*, becauſe beings which were *created* can have nothing in *common* with that being which is *ſelf-exiſtent*, and upon whoſe *will* and *power* all other things depend.

attention ſo fixed upon one object, that large portions of time, as meaſured by the clock, have paſſed away wholly unheeded; and every man who has ſeen a very ſtriking and uncommon object, muſt remember, that when the ſenſation was firſt impreſſed upon his mind, all other objects, ideas, and notions, and among the reſt the notion of time, were for a while excluded.

211 arifes from comparing the ſucceſſion of our ideas with the permanence of other objects.

No ſenſation, however, keeps poſſeſſion of the whole mind after it has ceaſed to be new; nor can the moſt vigorous exertions long preſerve any one idea from being driven off the ſtage by the ſucceeding train. Now this ſucceſſion of ideas appearing and diſappearing in their turns, is that which, when compared with the permanency of ourſelves and other things, gives us our firſt and juſteſt notion of time: for whilſt we are thinking, or whilſt a ſeries of ideas is ſucceſſively paſſing through our minds and vaniſhing, we know that we ourſelves and the things around us exiſt; and this exiſtence, or continuation of exiſtence, commenſurate with the train of our fleeting ideas, is what we call the *duration* of ourſelves and the things around us.

We are aware that our firſt notions of time have been often ſaid to be derived from *motion* as perceived by our ſenſes in the objects around us. It is obſerved by Euclid, that "if there were no *motion*, there could be no ſound, nor any ſenſe of hearing." "He might have added, (ſays the author of Ancient Metaphyſics), nor any other perception of ſenſe. Further, without motion there would have been no viſible world, nor generation or production of any kind here below; and, among other things, *time* could have had no exiſtence." All this is certainly true; but that corporeal motion, though the original ſource of all our ideas, is not that which *immediately* ſuggeſts to us the notion of time, will be readily granted by him who conſiders that motion itſelf is perceived by us only when it excites or accompanies a conſtant ſucceſſion of perceptions and ideas. Motion, when equable and very ſlow, ſuch as that of the hour-hand of a common watch, is not perceived by us in its courſe; nor can we diſcover that the thing has moved at all, till after we have been ſenſible of the lapſe of a conſiderable portion of what is commonly called *time;* when we diſcover that the hand of the watch has changed its place with reſpect to other objects which we know to be fixed. The ſame is true of motion remarkably quick: "Let a cannon-ball (ſays Locke) paſs through a room, and in its way take with it any limb or fleſhy parts of a man; it is as clear as any demonſtration can be, that it muſt ſtrike ſucceſſively the two ſides of the room: it is alſo evident that it muſt touch one part of the fleſh firſt, and another after, and ſo in ſucceſſion: and yet I believe nobody who ever felt the pain of ſuch a ſhot, or heard the blow againſt the two diſtant walls, could perceive any ſucceſſion either in the pain or ſound of ſo ſwift a ſtroke."

212 The ſucceſſion of ideas the meaſure of all other ſucceſſions,

Of theſe two phenomena a ſatisfactory account may be eaſily given; from which we think it will at the ſame time be apparent, that the ſucceſſion of the train of ideas in the mind is the meaſure and ſtandard of all other ſucceſſions. We know that the energy of mind which reviews a train of ſenſible ideas is of the very ſame kind with that which attends to a ſeries of paſſing ſenſations (ſee n° 69); and therefore it is natural to ſuppoſe that we can pay attention to ſenſations and ideas paſſing with nearly equal velocities. But it has been ſhown, that every ſenſation remains in the mind or ſenſorium for a very ſhort ſpace after the object which excited it is taken away: whence it follows, that a body communicating to the organs of ſenſe a ſeries of ſimilar impreſſions ſucceeding each other with remarkable rapidity, cannot excite a train of ſimilar and diſtinct ſenſations; becauſe the effects of the firſt and ſecond impreſſions not having vaniſhed when thoſe of the third and fourth arrive, the whole train of effects muſt neceſſarily coaleſce into one uniform ſenſation. This reaſoning is confirmed by experience. Similar ſounds ſucceeding each other at conſiderable intervals, are all diſtinctly perceived; and if the motion be accelerated gradually, it may be carried to a great degree of velocity before the ſounds be confounded and coaleſce into one. "Mr Herſchell having, by means of a clock, produced ſounds or clicking noiſes, which ſucceeded each other with ſuch rapidity that the intervals between them were, as far as could be judged, the ſmalleſt poſſible, found that he could evidently diſtinguiſh one hundred and ſixty of them in a ſecond of time; but beyond that he could by no effort of attention diſtinguiſh one ſound from another. The ſame philoſopher tried another experiment on viſible ſenſations. By means of the ſame handle and work of the clock, he cauſed a wheel in it to turn till it acquired the velocity of once in a ſecond. He continued to increaſe the velocity, and obſerved it while revolving at the rate of twenty times round in thirteen ſeconds, and could ſtill diſtinguiſh the teeth and ſpaces from each other; whence it appears (by a computation given at length), that he had two hundred and forty-ſix diſtinct viſible ſenſations generated by equable motion in a ſecond of time. The teeth of the wheel, he owns, were not ſo far viſible as to ſhow their ſhape diſtinctly, much leſs could they have been counted: but he very plainly diſtinguiſhed the circumference to be divided into teeth and ſpaces; and he ſuppoſes that the ſame diviſion might ſtill have been ſeen though the motion had been a little faſter, as far perhaps as two turns in a ſecond, equal to three hundred and twenty ſenſations*." The reaſon that the diviſion could not be ſeen whilſt the wheel moved more rapidly than twice round in a ſecond of time, was doubtleſs the continuance of that agitation in the brain from which each ſenſation proceeded, until a new impreſſion cauſed a new agitation, which coaleſced with the former and removed all diſtinction. Hence it is plain, that no external ſucceſſion can be perceived which moves with a greater velocity than that of which the internal train of ſenſations and ideas is capable. On the other hand, an external ſucceſſion which moves with leſs rapidity than that to which the internal flow of ideas may be reduced, either has not ſufficient force to generate ſenſations at all, or the ſucceſſive impreſſions from which the ſenſations proceed follow one another at ſuch diſtances as to permit the natural train of ideas to intervene between them, and thus deſtroy the perception of the ſucceſſion entirely.

To us, therefore, it ſeems evident, that the conſtant and regular ſucceſſion of ideas in the mind of a waking man, is the meaſure and ſtandard of all other ſucceſſions; of which, if any one either exceeds the pace of which our ideas are capable, or falls ſhort of it, the ſenſe of a conſtant and continued ſucceſſion is loſt, and we perceive it not but with certain intervals of reſt between. So that it is not motion, but the conſtant train of ideas in our minds, that ſuggeſts to us our firſt notion of time; of which motion no otherwiſe gives us any conception, than as it cauſes in our minds a conſtant ſucceſſion of ſenſations: and we have as clear a notion of time by attending to the train of ideas ſucceeding each other in our minds, as by a train of ſenſations excited by conſtant and perceptible motion.

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* Watſon's Treatiſe on Time.

That it is merely by comparing the permanent exiſtence of things with the fleeting ſucceſſion of ideas in our own minds that we acquire our notions of time, may perhaps be ſtill more evident from the following narrative quoted by Dr Beattie*, from *L'Hiſtoire de l'Acadamie Royal des Sciences pour l'annee* 1719. "A nobleman of Lauſanne, as he was giving orders to a ſervant, ſuddenly loſt his ſpeech and all his ſenſes. Different remedies were tried without effect. At laſt, after ſome chirurgical operations, at the end of ſix months, during all which time he had appeared to be in a deep ſleep or deliquium, his ſpeech and ſenſes were ſuddenly reſtored. When he recovered, the ſervant to whom he had been giving orders when he was firſt ſeized with the diſtemper, happening to be in the room, he aſked whether he had executed his commiſſion, not being ſenſible, it ſeems, that any interval of time, except perhaps a very ſhort one, had elapſed during his illneſs." If this ſtory be true, here was a man, who, by the train of ideas vaniſhing at once from his mind, loſt the perception of what was to others ſix months of time; and had all mankind been in his ſtate, the ſame portion of time would have been irrecoverably loſt even to the annals of chronology.

We are aware of an objection to any inference which may be drawn reſpecting the preſent queſtion from the caſe of this nobleman. It may be ſaid, that he had loſt, together with the perception of time, the perception of every thing beſides; and that, therefore, motion may ſtill be the cauſe from which a waking man derives his notions of time. But in reply to this objection, we beg leave to aſk, Whether if a ball had been put in motion on a table, and the nobleman had been told, that a body moved with a velocity of that ball would have been carried over ſo many thouſand miles of diſtance during the time that he lay in a ſtate of inſenſibility, he could from ſuch information alone have formed any tolerable notion of the length of time in which he was inſenſible? He certainly could not, for want of a ſtandard by which to meaſure the rapidity of the motion. He would, indeed, have known inſtantly that he had been inſenſible for a conſiderable length of time, becauſe he had the evidence of former experience that a body carried by perceptible motion over a great extent of diſtance would have generated in his mind a vaſt train of ſucceſſive ſenſations; but till he had attended this ball during part of its courſe, and compared with the permanency of other objects the ſeries of ſenſations which is generated in his mind, he would not have been able to gueſs with any thing near to accuracy the length of time, it would take to paſs over a thouſand miles.—The ſame inſenſibility of duration happens to every man in ſound ſleep. From having notions of time, ſuch as they are, formed in our minds, we never indeed ſuppoſe, however ſoundly we have ſlept, that the moment at which we awake in the morning is contiguous to that in which we fell aſleep at night. The reaſon is obvious; every man has been awake whilſt others were ſleeping, and has known by experience, that if they had been awake likewiſe a train of ideas would have paſſed through their minds which muſt have ſuggeſted to them the notions of time. Moſt men, too, have been frequently awake whole nights, and have thus acquired a notion of time as going on inceſſantly, whether perceived by them or not; and this notion being cloſely aſſociated with our ideas of night and morning, we inevitably ſuppoſe a portion of time to have elapſed between them, though unperceived by us in our ſleep. But were a man to ſleep without dreaming from Sunday night till Tueſday morning, and then to awake at his uſual hour as marked on the clock, there are numberleſs inſtances on record to convince us, that he would not of himſelf ſuppoſe, nor perhaps be very eaſily perſuaded, that more than one night had elapſed between his falling aſleep and the moment at which he awoke.

It being thus evident, that our notion of time is ſuggeſted by that compariſon which we inevitably make of the exiſtence of things permanent with the train of ideas inceſſantly paſſing through our minds; we may now perhaps be able to anſwer the queſtion, "What is time?" It muſt of neceſſity be one of three things, viz. either the ideal ſucceſſion itſelf; a certain quality inherent in all objects; or merely the relation of co-exiſtence between things that are permanent and the trains of fleeting ideas which ſucceed each other on the theatre of the imagination. It is not the firſt of theſe; for in every train of thought, the appearance of any one idea in the mind occupies no more of the extenſion of time, than a mathematical point occupies of the extenſion of diſtance. Ten thouſand mathematical points added together, would make no part of a line; and ten thouſand ideas made to coaleſce, if that were poſſible, would occupy no part of that mode of duration which is called *time*. A point is the boundary of a line, but no part of it: the appearance of an idea in the mind is inſtantaneous; and an inſtant is the boundary, but no part of time. Hence it follows, that were every thing inſtantaneous like ideas in a train, there could be no ſuch thing as time, ſince nothing could be ſaid to have in that ſenſe of the word any duration. That time is not a quality inherent in all objects, is likewiſe plain; for we have ſeen, that were *ideas* as permanent as objects, the notion of time could never have been acquired. Succeſſion, though it does not itſelf conſtitute time, is eſſential to its exiſtence; and were all motion to ceaſe, and the attention of men to be immoveably fixed upon one invariable object or cluſter of objects, *time* would ceaſe likewiſe. It remains, therefore, that time can be nothing elſe than the relation of co-exiſtence apprehended between things that are permanent and thoſe trains of fleeting ideas which inceſſantly ſucceed each other on the theatre of the imagination. Thus whilſt a man is ſteadily looking at one object, which, from its being common, does not occupy his whole mind, he may be conſcious of a thouſand ideas ſtarting up in

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Time a mere relation of co-exiſtence.

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* Eſſay on Truth.

in his imagination, and each in its turn vaniſhing the inſtant in which it appeared. Every one of theſe ideas had an exiſtence as well as the object at which he is looking; but the exiſtence of each of them was inſtantaneous and in ſucceſſion, whilſt the exiſtence of the external object is permanent. The object therefore, as contraſted with the train of ideas, is ſaid to endure or to exiſt in time, whilſt each idea is deſtitute of duration, and exiſts in no time.

214 Objections anſwered. To this theory ſome objections occur, which it will be incumbent upon us to obviate. It may be ſaid, that though each idea conſidered by itſelf is inſtantaneous, and occupies no time; yet the whole train when taken together, without being compared with any thing external, is perceived to occupy a conſiderable portion of that mode of duration; and that, therefore, time itſelf muſt be ſomething more than a mere relation between a fleeting ſucceſſion of ideas and objects of more permanent exiſtence. But how, we beg leave to aſk, is the whole train perceived to occupy any portion of time? Is it not by being compared with our own exiſtence? A man, whilſt a train of ideas is paſſing through his mind, may be ſuddenly deprived of all his external ſenſes, and then indeed it will be impoſſible for him to compare the fleeting exiſtence of this internal ſucceſſion with the more permanent exiſtence of external things; but whilſt he thinks at all, he muſt be conſcious of his *own* exiſtence, and cannot avoid perceiving, that whilſt his ideas paſs in conſtant ſucceſſion, each making an inſtantaneous appearance in his mind, he himſelf remains unchanged. Now, what is it that this perception ſuggeſts to the mind? Evidently nothing more than the relation of co-exiſtence between a fleeting ſucceſſion and a permanent object; for were it poſſible that the man could be deprived of memory as well as of his ſenſes, and ſtill have ideas ſucceeding each other in his mind, he would then think all objects equally fleeting; he would indeed be himſelf a mere ſucceſſion of inſtantaneous diſtinct perſons, and could have no notion whatever of time. His exiſtence, though it ſhould ſeem to endure half a century as eſtimated by others, muſt to himſelf appear to paſs away like a flaſh of lightening.

It may be ſtill further objected to our theory, that time is meaſured by motion; and that it ſeems very abſurd to talk of meaſuring a relation, eſpecially a mere *ideal* relation, by a real external thing. In anſwer to this objection, which at firſt ſight appears formidable, we beg leave to obſerve, that relations are equally ideal; and that yet many of them may be ſaid to be meaſured by real external things, with as much propriety as time can be ſaid to be meaſured by motion. When a man wiſhes to aſcertain the relation of quantity which one body bears to another, though he knows that ſuch a relation has no other than an ideal exiſtence, and cannot be conceived but in conjunction with the related bodies, he applies to them ſucceſſively ſome common ſtandard; and having diſcovered the relation which each bears to that, he compares the one relation with the other, and thus aſcertains the relation ſought. Juſt ſo it is with reſpect to motion meaſuring time. That which to each individual conſtitutes real time, is the relation of co-exiſtence between the fleeting ſucceſſion of his own ideas and other things of a more permanent nature. But a man has often occaſion to aſcertain the time of things external which fall not under the inſpection of his ſenſes; and in ſociety all men have tranſactions with one another to be performed in ſome determinate portion of time, though there are not, perhaps, two men exiſting whoſe ordinary trains of thought flow with preciſely the ſame rapidity. To remedy theſe inconveniences, it was neceſſary to invent ſome common ſtandard, by means of which men might aſcertain the duration of actions performed at a diſtance, and be able to keep appointments made with each other. The only ſtandard proper for theſe purpoſes is ſuch a conſtant and equable motion as has ſuggeſted a flux of perceptions common to all men in all ages and countries; and hence the motions of the heavenly bodies have been univerſally made uſe of for the common regulators of time. Theſe motions, however, do not conſtitute real and natural time, any more than a foot or a yard applied to two diſtant bodies conſtitutes the relation of quantity which theſe bodies bear to each other. They are merely ſtated meaſures, to be differently applied according to the different purpoſes which we have in view.

Thus, if a man in Europe wiſhes to know what would to him have been the *real* and *natural* time of an action performed in the Eaſt Indies, he has only to be told, that it was co-exiſtent, we ſhall ſuppoſe, with a diurnal revolution of the earth; and by comparing this common meaſure with his uſual flow of thought, he can form ſome notion of the extent of that train of ideas, which, had he been preſent, would to him have been ſucceſſively co-exiſtent with the action in queſtion. But when perſons have an appointment to keep, this common meaſure of motion muſt be differently, or rather partially, applied. In ſuch caſes, it is no part of their intention to compare their own exiſtence with that of the whole train of ideas which may paſs in the mind of each; for the reſult of ſuch a compariſon, which alone conſtitutes true and natural time, would not be the ſame in perhaps any two men: but their purpoſe is, to compare their own permanent exiſtence only with that train of ſenſations which ſhall be excited in the mind by the perceptible motion of the ſun, or any other body fixed upon which moves equably; and ſuch a train muſt conſiſt of an equal number of inſtants in all men. Neither the ſun, nor the hour-hand of a common watch, moves with ſuch apparent rapidity as to keep pace with the internal flow of thought of which the moſt phlegmatic man is conſcious. That theſe bodies move at all, is known only by their viſible change of place during the lapſe of a conſiderable portion of real time; and as there is in their courſe a certain number of places diſtinctly marked, to which alone it is agreed that the attention is to be turned, it is impoſſible that of time ſo computed two men can have different notions. Such time, however, is but partial; and the method of aſcertaining it, when compared with that by which we aſcertain real time, has a ſtriking reſemblance to that by which we aſcertain the relation of partial quantity between two diſtant bodies. When it is our purpoſe to aſcertain the relation of real quantity which one body bears to another, we apply the common ſtandard to each in every dimenſion of length, breadth, and depth; but when we have no other view than to aſcertain the relation of length which the one bears to the other, we apply the common ſtandard to each in that dimenſion only. Juſt ſo it is with regard to real and partial time. When an individual wiſhes to aſcertain what would to him have been the duration of any action which he did not ſee performed, he applies the common ſtandard to the exiſtence of that action, and to the uſual flow of his own thoughts; but when two men talk of the duration of any action, or agree to meet on ſuch a day, they compare the exiſtence of the action, or the diſtance intervening between the preſent moment and the day of meeting, only with that partial train of ſenſations which by the common ſtandard is generated in an equal number, and in the ſame order, in the minds of both.

215 Time muſt have had a beginning.

It will be ſaid, that if time be nothing more than a mere relation ſubſiſting between trains of ideas or other fleeting objects, and things of a more permanent exiſtence; and if the univerſe had a beginning; either time muſt have had a beginning likewiſe, or the Deity cannot be immutable. We allow the force of the argument; but inſtead of an objection, we conſider it as a confirmation of the truth of our theory. The Deity, who is immutable, exiſts not in time, but in eternity; and that theſe, though from the poverty of language they are both called modes of duration, are yet very different from each other, we ſhall endeavour to prove in the next chapter.

CHAP. VIII. *Of* INFINITY *and* ETERNITY.

216 Why we treat of infinity and eternity among the adjuncts of body.

As corporeal ſubſtance is certainly not infinite, and as the preſent material ſyſtem has in itſelf every evidence of its not being eternal, it may ſeem ſtrange, perhaps, to the reader, that we ſhould treat of infinity and eternity among the adjuncts of body. But in modern metaphyſics theſe words are uſed in a vague ſenſe to denote the extent of ſpace and time; and in this chapter it is our intention to do little more than aſcertain their meaning, and to ſhow, in oppoſition to ſome celebrated names, of what ſubjects they may not be predicated. There is a mathematical and a metaphyſical infinity, which, though often confounded, ought to be kept diſtinct. In mathematics, extenſion is ſaid to be diviſible *ad infinitum*, and number is ſometimes conſidered as infinite: but in metaphyſics theſe modes of expreſſion are extremely improper. A poſitive and metaphyſical infinite is that which has no limits, and to which no addition can be made; but it is obvious that there is no number which may not be enlarged, nor any poſitive idea of extenſion which has not limits, and which may not be either increaſed or diminiſhed. The infinity of the mathematician is termed *infinity in power*, and that of the metaphyſician *abſolute infinity*. The firſt conſiſts in this, that a being, however great or ſmall it be ſuppoſed, may ſtill be conceived to poſſeſs more greatneſs or minuteneſs than we can form an idea of, even after the utmoſt ſtretch of human thought. Thus when it is ſaid that all extenſion as ſuch is infinitely diviſible, it is not meant that every extended ſubſtance contains an infinite number of *real parts*; for then the parts of an inch would be equal to thoſe of a league: but the meaning is, that in ideal extenſion we can never reach the end of ideal diviſion and ſubdiviſion. In like manner, when it is ſaid that number is infinite, the meaning is not that any poſitive number is without limits, or the poſſibility of increaſe, but that we might go on for ever, adding unit to unit, without approaching nearer to the end of the proceſs. If, therefore, the mathematician would ſpeak properly, and without the affectation of paradox, he ought to ſay that all extenſion as ſuch is *indefinitely* diviſible, and that unit might be added to unit without end; but theſe phraſes ſuggeſt notions very different from that of a metaphyſical infinite, which is ſomething poſitive to which nothing can be added (B).

217 Space and time ſuppoſed to be, the one infinite, and the other eternal:

That there is ſomething poſitively infinite, has been very ſeldom queſtioned; but it has been warmly diſputed among metaphyſicians what ſubjects are infinite. Dr Clarke and his adherents have contended that ſpace and time are real things; that they are both of neceſſary exiſtence; that the former impreſſes us with the idea of its infinity, and that the latter is poſitively eternal. "Time and ſpace (ſays the Doctor*) are the *ſine qua non* of all other *things*, and of all other *ideas*. To ſuppoſe either of them *finite*, is an expreſs *contradiction* in the idea itſelf. No man *does* nor *can* poſſibly *imagine* either of them to be finite; but only either by *non-attention*, or by *choice* he attends perhaps to *part* of his *idea*, and *forbears attending to* the remainder. They who ſuppoſe *ſpace* to be nothing but a *relation between two bodies* are guilty of the abſurdity of ſuppoſing that which is *nothing* to have *real qualities*: *For the ſpace which is between two bodies* is always unalterably juſt what it was, and has the very ſame dimenſions, quantity, and figure, whether *theſe* or any *other bodies* be there or any where elſe, or not at *all*. Juſt as *time* or *duration* is the ſame, whether you turn your *hour-glaſs* or no, or whether the ſun moves or ſtands ſtill, or whether there *was* or *was not any ſun*, or any *material world* at all. To ſet *bounds* to ſpace is to ſuppoſe it *bounded* by ſomething which itſelf *takes up ſpace*, and that's a *contradiction*; or elſe that it is *bounded by nothing*, which is another contradiction. To ſuppoſe ſpace *removed*, *deſtroyed*, or *taken away*, amounts to the abſurd ſuppoſition of removing a thing away *from itſelf*; that is, if in your *imagination* you *annihilate* the *whole* of *infinite ſpace*, the whole of *infinite ſpace* will ſtill remain; and if you annihilate any *part* of it, *that part* will ſtill *neceſſarily* remain, as appears by the unmoved ſituation of the *reſt*; and to ſuppoſe it *divided* or *diviſible* amounts to the ſame contradiction."

The abſurdity of conſidering ſpace as a real external thing has been already evinced in chap. 4th, p. 549, where it was ſhown how we acquire the notion, and what kind of notion it is. Space, as was there obſerved, may be conceived either as the mere abſence and poſſibility of body; or as ideal extenſion, united to, and inhering in, an ideal ſubſtratum. Taken in the former ſenſe, it is an object of pure intellect; in the latter, it is

* Demonſtration of the Being and Attributes of God, and Correſpondence with a Gentleman of Glouceſterſhire.

(B) Ου γαρ ου μηδεν εξω αλλ ου αει τι εξω εστι, τουτο απειρον εστι. *Ariſt. Phyſ. Auſcult. Lib.* 9. *cap.* 9. *page* 492, *Tom.* 1. *Oper.*

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218 but improperly.

is an *idea* or *form* in the imagination. That the abſence of body or matter is the *ſine qua non* of all other things, and all other ideas, Dr Clarke was not diſpoſed to affirm, when he made the divine ſubſtance, to pervade every material atom in the univerſe; and to talk of the abſence of body being infinite is a palpable contradiction, unleſs Berkeley's doctrine be true, that the material world has no exiſtence. To ſay that the *poſſibility* of matter is infinite, is to uſe language which has no other meaning than that, however far the material world be on all ſides extended, its extenſion may ſtill be conceived greater and greater *ad infinitum.* This is a poſition which no philoſopher ancient or modern has ever denied; but it is ſo far from implying that we have a poſitive idea of the infinity of the material world, or of any adjunct of the material world, that it is abſolutely inconſiſtent with ſuch infinity. Whatever is capable of perpetual increaſe muſt certainly have limits, and every new addition is the limit of that to which the addition was made.

219 Neither ſpace nor

Taken in the ſecond acceptation as an ideal extenſion united with an ideal *ſubſtratum*, ſpace is ſo far from being infinite in any ſenſe of the word, that we will venture to aſſert no man ever contemplated ſuch a *form* in his own imagination, without conceiving it to be bounded. Of this, at leaſt, we are certain, that when we have attempted to frame a poſitive idea of pure ſpace, it has not been in our power to diveſt that idea of limits. Thoſe who can frame in their minds real and poſitive ideas wholly abſtracted from every individual object, may indeed perform in this way many feats above our abilities; but as we poſſeſs no ſuch powers of abſtraction, every thing which we can call an idea is limited in the ſame manner that the object itſelf is limited from which the idea was derived.—Thus, the largeſt expanſion that ever we beheld is the concave hemiſphere; and when we try to form the largeſt poſitive idea of pure ſpace, all that we can do is to figure to ourſelves that concave empty of body. We may, indeed, ſuppoſe its diameter to be either a million or ten thouſand millions of miles; and we may go on enlarging it *ad infinitum:* but when we return from this proceſs of intellect to the contemplation of the ideal forms in the imagination, none of theſe forms appear to us larger or more extended than the hemiſphere, which is the object of ſenſe, and they all appear to be bounded, and bounded in the very ſame way.

220 time can be poſitively infinite; and why.

With reſpect to the eternity of time, we think Dr Clarke equally miſtaken as with reſpect to the infinity of ſpace. Of time, indeed, we cannot properly ſpeaking have any *idea* or mental *form.* Time, as we have ſeen, is a mere relation, and is in itſelf the creature of the mind which has no external *idiatum.* It is ſuggeſted, however, by the fleeting ſucceſſion of our ideas, compared with the more permanent exiſtence of other objects; and therefore ſucceſſion is eſſential to it. But nothing which has parts, whether co-exiſtent or in ſucceſſion, can be poſitively infinite. For, “ in an infinite ſeries of ſucceſſive generations of men, for inſtance, there will be ſeveral infinites that are parts of one another, and by conſequence one greater than another: which (as has been well argued *) is an expreſs contradiction, ſince the greater muſt neceſſarily bound the leſs, and exceed its limits by ſo much as it is greater than it; that is, muſt make it not infinite. Infinite generations contain an infinitely greater infinity of particular men. An infinite number of men muſt have twice as many hands, and ten times as many fingers, and ſo on. Infinite time has an infinity of ages; theſe a much greater infinity of years, days, hours, &c. Space likewiſe (according to Dr Clarke) has three dimenſions, all infinite. It muſt, therefore, contain an infinity of ſurfaces, an infinitely greater infinity of lines, and a ſtill infinitely greater infinity of phyſical points. The caſe is the ſame in number itſelf, which, if we ſuppoſe it to contain an abſolute infinity of thouſands (and we may as well do that as imagine it to comprehend an infinity of units), it will contain ten times as many hundreds, fifty times as many ſcores, and ſo on All this is only the *indefiniteneſs* of number, which we in vain attempt to turn into a poſitive infinite with which it is totally incompatible. For let us add *one* to any of theſe infinite ſeries of generations, ages, lines, or numbers, which we know to be always in our power, and if it was abſolutely infinite before, here is one more than infinite. If it only becomes infinite now, then one finite added to another finite makes infinity. If it be no larger after the addition than it was before, then one part added to another adds nothing; all which are abſurdities. The ſame will appear, if we ſubſtract a part from this ſuppoſed abſolute infinite, which may be done in any of the formentioned ſubjects, as well as in every thing which admits of parts, or may be taken in pieces by the mind.”

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221 The uſual reply to the foregoing reaſoning ſhown

To this kind of reaſoning Dr Clarke replies as follows: “ To endeavour to prove that there cannot poſſibly be any ſuch thing as *infinite time* or *ſpace*, from the impoſſibility of an addition of finite parts ever compoſing or exhauſting an infinite; or from the imaginary inequality of the number of years, days, and hours, that would be contained in the one; or of the miles, yards, and feet, that would be contained in the other, is ſuppoſing infinites to be made up of numbers of finites; that is, it is ſuppoſing finite quantities to be *aliquot* or *conſtituent parts* of infinite, when indeed they are not ſo, but do all *equally*, whether *great* or *ſmall*, whether *many* or *few*, bear the very ſame proportion to an infinite, as mathematical points do to a line, or lines to a ſuperficies, or as moments do to time, that is, none at all. No given number or quantity can be any *aliquot* or *conſtituent* part of infinite or be compared at all with it, or bear any kind of proportion to it, or be the foundation of any argument in any queſtion concerning it.”

If it be indeed true, and it is that for which we contend, that no given number or quantity can be any aliquot or conſtituent part of infinite, or be compared at all with it; then it undeniably follows, not that miles, yards, and feet, are no conſtituent parts of ſpace; or years, days, and hours, conſtituent parts of time; but that ſpace and time cannot poſſibly be poſitive infinites. This, we ſay, follows undeniably: for nothing is more evident, than that all quantities of the ſame kind, from the largeſt to the leaſt, bear a certain proportion to each other; and upon the ſuppoſition that ſpace is a real extended thing, miles, yards, and feet are included in it, and bear to it the relation of parts to a whole. The ſame is true of time, days, and hours. To affirm (for no proof is offered), that all

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* Dr Law's Inquiry into the Ideas of Space, Time, Immenſity, and Eternity. See alſo the ſame acute writer's tranſlation of King's Origin of Evil.

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to be a petitio principii.

all finite quantities, whether great or ſmall, whether many or few, do equally bear the very ſame proportion to an infinite, as mathematical points do to a line, or as moments do to time, is plainly to beg the queſtion—" that *ſpace* conſidered as a real extended thing is *infinite*;" and to beg it, too, in oppoſition to the common ſenſe and reaſon of mankind. Mathematical points we all know to be nothing real, but merely negations of extenſion; but ſuppoſing ſpace to be ſomething real and extended, can any man perſuade himſelf that a mile or a million of miles of this ſpace is likewiſe a mere negation of extenſion? With him who can bring himſelf to this perſuaſion, we pretend not to argue. He is poſſeſſed of faculties, whether true or falſe, of which we are deſtitute.

That finite quantities, whether great or ſmall, do all equally bear the ſame proportion to an *infinite in power*, is indeed true; but it is no great diſcovery: for ſuch an infinite, as we have ſeen, is nothing but the continued poſſibility of repeating the ſame mental proceſs of addition or multiplication; and he who can go on for ever adding, in his own imagination, foot to foot, or hour to hour, will find it equally eaſy to add, in the ſame manner, league to league, or age to age. If he can perform the one operation, he muſt likewiſe have power to perform the other; and he cannot but perceive that it is as impoſſible to come to an end of adding league to league, or age to age, as of adding foot to foot, or hour to hour; but then he muſt know that theſe leagues, feet, ages, and hours, are not real external things, but mere ideas and notions in his mind. If ſuch powers of ideal multiplication and addition be what Dr Clarke means by the ideas of ſpace and time, it is indeed a contradiction to ſuppoſe either of them limited; for that is to ſuppoſe our powers different from what we know them to be by conſciouſneſs and experience. But to confound *powers* with the *objects* of thoſe powers, is certainly very inaccurate; and to ſuppoſe, becauſe we can go on for ever adding one portion of ideal ſpace or time to another, that therefore our ideas of ſpace and time are in themſelves poſitively infinite, is a contradiction: for to an idea poſitively infinite, it is obvious that nothing can be added. Either, therefore, ſpace and time do not impreſs us with the ideas of their poſitive infinity; or we cannot have the power of adding league to league, and age to age, without end.

" But (ſays the Doctor), to ſuppoſe ſpace removed, deſtroyed, or taken wholly away, amounts to the abſurd ſuppoſition of removing a thing from itſelf; that is, if in your imagination you remove the whole of ſpace, the whole of ſpace will ſtill remain." True, every man has ideas of ſpace treaſured up in his imagination, which the ſound of the very word ſpace will at all times bring into his immediate view; and whilſt he has ſuch ideas, it is impoſſible that he ſhould not have them; which is all the myſtery of the matter, and amounts to nothing more than that a thing cannot be and not be at the ſame inſtant. When the Doctor affirms, that if " you annihilate any part of ſpace, that part will neceſſarily remain, as appears by the unmoved ſituation of the reſt"; we are not certain that we perfectly underſtand him. A man may ſurely think of a cubical inch without thinking of a foot or a yard; and he may ſuppoſe the inch taken away from the foot or the yard, and theſe ideal quantities ſo much leſſened by the ſubtraction. But if the Doctor be here again confounding the powers of the mind with the poſitive ideas of ſpace, the ſentence when explained will be ſeen to contain nothing to his purpoſe. Every man has the power of contemplating in idea millions of miles, and millions of ages, and of adding mile to mile, and age to age, without end; and if he try to deprive himſelf of any part of this power, or to fix a limit to the mental proceſs of addition, he will find that in ſpite of himſelf his imagination will ramble beyond the limit aſſigned, and that he has attempted an impoſſibility. This, however, is ſo far from being a proof that his ideas of ſpace and time are poſitively infinite, that, as we have already obſerved, it is a proof of the contrary.

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Space and time are ſaid to be the ſine qua non of all other things; but

But (ſay this great man and his followers) " ſpace and time are the *ſine qua non* of all other things and all other ideas. The ſuppoſal of the exiſtence of *any thing whatever* includes neceſſarily a *preſuppoſition* of the exiſtence of *ſpace* and *time*;" and therefore, if there be any thing infinite and eternal, ſpace and time muſt likewiſe be ſo.

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there are things which have no relation whatever to ſpace, or

To every corporeal ſubſtance, and every idea of ſuch ſubſtance, ſpace and time are indeed neceſſary: for every body has extenſion and duration; and every idea of a particular body, being nothing but a ſecondary perception in the imagination or memory, muſt have the ſame relation to imaginary extenſion, that the object from which it was derived has to extenſion which is real. Every idea, too, which remains in the imagination whilſt a train of other ideas paſſes ſucceſſively in view, or whilſt external things are perceived to change, has real time. But will any man ſay that *conſciouſneſs*, our notion of *power*, our acts of *willing*, or even *taſtes*, *ſounds*, and *ſmells*, are extended, or that the ſuppoſal of their exiſtence neceſſarily implies a preſuppoſition of the exiſtence of ſpace? We acquire our ideas of extenſion and ſpace by means of our ſenſes of touch and ſight; and we learn from experience, that things external and extended are the cauſes of our ſenſations of taſte, ſound, and ſmell. The effects are in our minds cloſely aſſociated with the ideas of their cauſes; and it is not perhaps eaſy to think of a particular ſound, taſte, or ſmell, without at the ſame time thinking of the object by which it was at firſt excited in the mind: but had we been originally formed with the powers of conſciouſneſs, thinking, and willing, and with no other ſenſes than thoſe of taſting, ſmelling, and hearing, it is obvious that we never could have had the idea of *ſpace*; and therefore, that idea cannot poſſibly be neceſſary to the preſuppoſition of every thing elſe. To conſciouſneſs, thinking, and willing, ſpace is ſo far from being neceſſary, that we cannot perceive any the moſt diſtant relation between them. It is not more difficult to conceive a part greater than the whole, than it is to conceive an ell of *conſciouſneſs*, of *thought*, or of *will*; nor is it in the power of any man to make *ſpace* and *ſweetneſs* coaleſce in his mind ſo as to form of the two ſimple ideas one complex conception. The very reverſe is the caſe with reſpect to the objects of ſight and touch. The idea of every thing which we ſee and handle neceſſarily

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ly coaleſces in the mind with the idea of ſpace, nor can we poſſibly ſeparate the one from the other; but the things which we ſee and handle are neither infinite nor capable of infinity.

225 to time.

With reſpect to time, the ſame obſervations will be found to be juſt as with reſpect to ſpace. Whatever is liable to change, exiſts in time and cannot be eternal; but if there be any being immutable, and who views at once all things which to us are paſt, preſent, and to come, the exiſtence of that being is not commenſurable with time. That ſuch a being is poſſible no man can doubt, who reflects, that if we had one permanent idea invariably in the mind, we ſhould never have acquired the *notion* of ſucceſſion or of time; and that if there were *actually* no *change* in nature there could not poſſibly in nature be any ſuch *thing as time*. Every man, therefore who can conceive exiſtence without change, muſt be convinced, that "the ſuppoſal of the exiſtence of any thing whatever does *not* neceſſarily include the preſuppoſition of the exiſtence of time, and that there may be an eternity diſtinct from time, as well as an infinity diſtinct from ſpace; nay that nothing which is properly infinite and eternal can poſſibly occupy either ſpace or time.

226 Infinity and eternity, what they are.

If it be aſked, what kind of infinity and eternity they are which have no relation to ſpace and time? Cudworth, treading in the footſteps of the ancients, has long ago anſwered, that they are "abſolute perfection, and neceſſary exiſtence. For (ſays he), *infinite underſtanding* and *knowledge* is nothing elſe but *perfect* knowledge, which hath in it no defect or mixture of ignorance, but knows whatſoever is knowable. In like manner, *infinite power* is nothing elſe but *perfect* power, which hath in it no defect or mixture of impotency—a power which can do every thing which is poſſible or conceivable. Laſtly, *infinity of duration*, or *eternity*, is really nothing elſe but *perfection*, as including in it *neceſſary exiſtence* and *immutability*; ſo that it is a contradiction to ſuppoſe ſuch a being to have had a beginning, to ceaſe to be, or to ſuffer or be affected by any change whatever. And becauſe infinity is perfection, therefore nothing which includes in its idea or eſſence any thing of *imperfection*, as every poſitive idea of number, corporeal magnitude, and ſucceſſive duration evidently does, can be truly and properly infinite." *

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It muſt indeed be confeſſed, that the idea of ſucceſſion ſo inſinuates itſelf into our uſual ideas of exiſtence, and is ſo cloſely connected with the exiſtence of all finite beings, that we find it extremely difficult to imagine the eternal exiſtence of God, any otherwiſe than as an eternally continued ſeries or ſucceſſion. Our conſtant converſation with material objects, and the aſſociations thence ariſing, make it almoſt impoſſible for us to conſider things abſtracted from time and ſpace; yet we have the evidence of experience and conſciouſneſs, that an idea may be conceived without relation to ſpace and time, and that ſpace and time cannot be made to coaleſce with ſome of our ideas. The ſame muſt be true with reſpect to infinity and eternity; for we have ſeen that neither ſpace, time, nor any thing elſe which conſiſts of parts, whether continuous or ſucceſſive, can be ſuppoſed to be poſitively infinite, as the ſuppoſition implies the moſt palpable contradiction. But that there may be perfect power, perfect knowledge, and permanent invariable exiſtence, is ſo far from implying any contradiction, that even we, whoſe faculties are ſo very narrow, can yet make ſome advances towards the conception of ſuch perfections. Thus, every man of common underſtanding knows that ſome things are in themſelves poſſible, and others impoſſible, to be performed by any power. Of theſe poſſibilities and impoſſibilities a philoſopher knows more than an illiterate man; and one philoſopher knows more than another. An intellect more perfect knows more of them than any man; and that intellect which knows them all muſt be abſolutely perfect, and incapable of improvement, becauſe it knows every thing which is to be known. The ſame is true of perfect power:—but we ſhall treat of real infinity and eternity more at large when we come to demonſtrate the being and attributes of God. At preſent it is ſufficient to have ſhown, that nothing can be poſitively infinite but a being abſolutely perfect; which never was not, which can produce all things poſſible and conceivable, and upon which all other things muſt depend.

PART III. OF MINDS AND THEIR POWERS.

CHAP. I. *Of* MIND *in* GENERAL.

THE ſcience of metaphyſics comprehends every thing into the exiſtence, nature, or cauſes, of which any inquiry may be made. But all things of which we have any notion or idea may be divided into mind and body, with their various powers, qualities, and adjuncts. By body is meant that which is ſolid, extended, inert, and diviſible; and its ſeveral adjuncts are ſpace, motion, number, and time. The only mind with which we are *intimately* acquainted is our own; and we know that it is poſſeſſed of the powers of ſenſation, perception, retention, conſciouſneſs, reflection, reaſon, and will. Theſe are totally different from extenſion, ſolidity, diviſibility, and motion; and therefore it is proper to diſtinguiſh the being of which they are powers by another name than that of body.

227 Mind Diſtinguiſhed from body.

228 Probably minds of different orders.

Of bodies there are various kinds poſſeſſing various ſenſible qualities; and from analogy it is reaſonable to conclude, that there may be various claſſes of minds endowed with different kinds or degrees of power. For this indeed we have ſtronger evidence than that of analogy. Brute animals evidently poſſeſs the powers of perception and ſpontaneity with ſome degree of conſciouſneſs; but as they appear not to reflect upon their own conduct, or to have their actions influenced by motives, their minds are inferior to ours, though ſtill perfectly diſtinct from mere extended, inert, and diviſible ſubſtances. Mind, therefore, conſidered with reſpect to its powers, is evidently different from body conſidered with reſpect to its qualities. This is indeed a truth which has ſeldom if ever been controverted; but it has been long and warmly diſputed, Whether mind and body be not both compoſed of the ſame firſt matter?

229 The abſurd hypotheſis of Hobbes reſpecting mind.

Hobbes ſuppoſed, that every material atom is endowed with the faculty of ſenſation (c); but that for want of memory each ſenſation is momentaneous, being inſtantly and wholly effaced as ſoon as its cauſe is removed. Though this hypotheſis is too abſurd to require a formal and laboured confutation, it may not be improper to obſerve, that, if it were true, the hairs of a man's head would feel extreme pain when pinched by the hot iron of the hair-dreſſer; and that the nails of his fingers would be ſeverely tortured when under the operation of the knife or the raſp.

230 Other abſurd hypotheſes.

Others have ſuppoſed that each atom of matter has a *tendency towards* ſenſation and perception; and that when a ſufficient number of theſe atoms are brought together in a certain order, the *united tendencies* produce the *actual* powers which diſtinguiſh mind from groſs body. This ſuppoſition is if poſſible more abſurd than that of Hobbes. Senſation and perception are of ſuch a nature, that a mere *tendency towards* them is inconceivable. A thing muſt either be ſenſible and percipient, or inſenſible and inert: there is evidently no medium. Or if we could ſuppoſe each individual atom to have a *tendency* towards ſenſation, it would by no means follow that a number of ſuch atoms brought together in any poſſible order would become one ſentient, thinking, and active being. A number of bodies laid upon an inclined plain have each a *tendency* to roll downwards; but if the declivity of the plain be not ſuch as that their ſeparate tendencies may overcome the reſiſtance oppoſed to each individual body by friction, the *united tendencies* of all the bodies when brought together will not be able to overpower the reſiſtance of their united frictions. Juſt ſo is it with reſpect to ſenſation and perception: If the tendency of one atom cannot overcome one degree of inertneſs, the tendency of a thouſand atoms will not overcome a thouſand degrees of the ſame inertneſs.

231 Only two opinions at preſent on the ſubject.

We have juſt mentioned theſe abſurd ſuppoſitions that our article might be complete: but it is proper to inform the reader, that, ſo far as we know, neither of them has for theſe many years been maintained by any philoſopher of eminence either at home or abroad. The opinions on this ſubject, which at preſent divide the republic of letters, are two; and theſe alone are worthy of examination. One party maintains, That perception, memory, reaſon, and will, &c. are the powers of a being which muſt be immaterial and indiviſible: The other alleges, That as we know nothing of theſe powers but from our own conſciouſneſs, and as we can trace them in ourſelves to the brain and no farther, we have no reaſon to ſuppoſe that they are the powers of any ſubſtance diſtinct from matter. Both parties, however, diſtinguiſh that which in man is the ſubject of thought from his external organs of ſenſe, and agree to call it by the name of *mind;* though the one conſiders it as compoſed of the ſame firſt matter with the duſt of the ground; whilſt the other believes it to have no property whatever in common with that matter.

Were we to adopt ſome of the ancient methods of philoſophiſing, this important queſtion might be ſoon decided. A moſt reſpectable writer, who has laboured to reſtore the metaphyſics of Plato and Ariſtotle, hopes to confute the materialiſts, by laying down what they muſt think arbitrary definitions of mind and matter, and then ſhowing that the one is not the other. "In all the parts of the material world (ſays he) there is a perpetual *motion:* For the celeſtial bodies move conſtantly in one reſpect or another; and all here below is in a continual viciſſitude of generation and corruption, which cannot be without *motion.* Now, where there is *motion*, there muſt be ſomething that *moves:* What is *moved* I call *body;* what moves I call *mind.*" From this definition he undertakes to prove, that mind muſt be immaterial. "That there is a relation between *moving* and *being moved* (ſays he), nobody can deny; and the relation is no other than that of *action* and *paſſion*. But the nature of relation is ſuch, that it muſt neceſſarily be between two things at leaſt; and it is further neceſſary, that the two things related ſhould exiſt together. Hence, if there be that which *moves*, there muſt be a different thing that *is moved;* and wherever the one is, the other muſt neceſſarily be; ſo that nothing can move itſelf. This being eſtabliſhed, I ſay that what *moves* muſt be either material or immaterial: for the one of theſe being the negation of the other, there can be no middle betwixt them; becauſe a thing muſt neceſſarily *be*, or not *be*. If then it be immaterial, there is an end of the queſtion: but if it be ſaid to be material, then I ſay that it muſt be *moved* itſelf before it can move any thing elſe; for it is only in that way that body can move body. If then it muſt be firſt moved itſelf, but cannot itſelf move itſelf, what is it that moves it? If it be anſwered, That it is another material mover, then I repeat the ſame queſtion, to which the ſame anſwer muſt be given: and ſo we have an infinite ſeries of *material movers*, without any beginning or *principle* of *motion*. Now this is abſurd, and contradictory to this firſt principle of natural philoſophy, admitted by all philoſophers ancient and modern, That *nothing can be produced without a cauſe* ‡."

For the immateriality of the human mind, and of every being endowed with the powers of perception and thought, the learned writer has better arguments; but it is upon this chiefly that he reſts his perſuaſion, that mind is the only *mover* in the univerſe. It is needleſs to obſerve, that in the very definitions and axioms upon which this reaſoning is built, the thing to be proved is taken for granted: for if it be ſelf-evident,

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‡ Ancient Metaphyſics.

(c) Scio fuiſſe philoſophos quoſdam, eoſdemque *viros doctos*, qui corpora omnia ſenſu prædita eſſe ſuſtinuerunt: *Nec video*, ſi natura ſenſionis in reactione ſola collocaretur, QUOMODO *refutari poſſint.* Sed etſi ex reactione etiam corporum aliorum, phantaſma aliquod naſceretur; illud tamen, remoto objecto, ſtatim ceſſaret. Nam niſi ad retinendum motum impreſſum, etiam remoto objecto, apta habeant organa, ut habent animalia; ita tantum ſentient, ut nunquam ſenſiſſe ſe recordentur. Senſioni ergo, quæ vulgo ita appellatur, neceſſario adhæret memoria aliqua. *Hobbes's Phyſic*, cap. 25. ſect. 5.

dent, that what *moves* is, in the author's ſenſe of the word, *mind*, that what is *moved* is *body*, and that *nothing can move itſelf*, all reaſoning on the ſubject is ſuperfluous. This, however, is ſo far from being ſelf-evident, that a materialiſt may reply, "every animal moves itſelf, and yet every animal is nothing more than a ſyſtem of matter." This poſition, whether true or falſe, can neither be proved nor confuted by arguments *à priori* founded on general definitions. That animals move themſelves, and that to the ſenſes they appear to be nothing elſe than ſyſtems of matter, are facts which cannot be controverted. If we would know whether they have in them a principle of motion which is not material, we muſt ſubmit to the laws of induction (ſee LOGIC); and by inveſtigating the eſſential qualities of matter, endeavour to aſcertain whether a material ſyſtem can be rendered active. That we ourſelves have active powers, we know by the moſt complete of all evidence, *viz.* conſciouſneſs of their energies; and it has been already ſhown, that ſuch powers as we experience in ourſelves cannot exiſt but in a ſubject poſſeſſed of will and underſtanding. The queſtion therefore to be firſt decided between the materialiſts and immaterialiſts is, Whether the powers of conſciouſneſs, underſtanding, and will, can reſult from the particular organiſation of a ſyſtem of matter? If they can, we have no reaſon to attribute them in man to any other ſource: If theſe powers appear neceſſarily to require an immaterial principle for their ſupport, it will probably be granted, that an immaterial principle is the ſource of every power and every motion in the univerſe; and the doctrine of *mind*, in the ſtricteſt ſenſe of the word, will be ſufficiently eſtabliſhed.

232
The proper method of inveſtigating the nature of mind.

CHAP. II. *Of the* SUBSTANCE *of the* HUMAN MIND.

233
Arguments for the immateriality of the human mind.

THE moſt celebrated materialiſt of this or perhaps of any other age is Dr Prieſtley; who having in his own imagination diveſted matter of ſolidity, and reduced it to mere centres of attraction and repulſion, obſerves, that "if one *kind of ſubſtance* be capable of ſupporting all the known *properties* of man; that is, if thoſe properties have nothing in them, that is abſolutely incompatible with one another; we ſhall be obliged to conclude (unleſs we openly violate the rules of philoſophiſing, which will not authoriſe us to *multiply cauſes* or kinds of ſubſtance *without neceſſity)*, that no other kind of ſubſtance enters into his compoſition; the ſuppoſition being manifeſtly *unneceſſary*, in order to account for any appearance whatever.—All the properties that have hitherto been attributed to matter, may be compriſed under thoſe of attraction and repulſion. Beſides theſe, man is poſſeſſed of the powers of *ſenſation* or *perception*, and *thought*. But if, without giving the reins to our imaginations, we ſuffer ourſelves to be guided in our inquiries by the ſimple rules of philoſophiſing abovementioned, we muſt neceſſarily conclude, that theſe powers alſo may belong to the ſame ſubſtance that has alſo the properties of attraction, repulſion, and *extenſion* (D), which I as well as others call by the name of *matter*. The reaſon of the concluſion is ſimply this, that the powers of ſenſation or perception and thought, as belonging to man, have never been found but in conjunction with a certain *organiſed ſyſtem of matter*; and therefore that thoſe powers neceſſarily exiſt in and depend upon ſuch a ſyſtem. This at leaſt muſt be our concluſion, till it can be ſhown that theſe powers are incompatible with the other known properties of the ſame ſubſtance; and for this I ſee no ſort of pretence."

This is what Dr Prieſtley calls the proper and direct proof that the ſentient principle in man is the material ſubſtance of the brain; and he enforces it by the following obſervations: "Had we formed a judgment concerning the neceſſary ſeat of thought by the circumſtances that *univerſally accompany it*, which is our rule in all other caſes, we could not but have concluded that in man it is a property of the *nervous ſyſtem*, or rather of the brain; becauſe, as far as we can judge, the faculty of thinking, and a certain ſtate of the brain, always accompany and correſpond to one another; which is the very reaſon why we believe that any property is inherent in any ſubſtance whatever. There is no inſtance of any man retaining the faculty of thinking when his brain was deſtroyed; and whenever that faculty is impeded or injured, there is ſufficient reaſon to believe that the brain is diſordered in proportion; and therefore we are neceſſarily led to conſider the latter as the ſeat of the former. Moreover, as the faculty of thinking in general ripens and comes to maturity with the body, it is alſo obſerved to decay with it; and if, in ſome caſes, the mental faculties continue vigorous when the body in general is enfeebled, it is evidently becauſe in thoſe particular caſes the *brain* is not much affected by the general cauſe of weakneſs. But, on the other hand, if the brain alone be affected, as by a blow on the head, by actual preſſure within the ſkull, by ſleep, or by inflammation, the mental faculties are univerſally affected in proportion. Likewiſe, as the mind is affected in conſequence of the affections of the body and brain, ſo the body is liable to be reciprocally affected by the affections of the mind, as is evident in the viſible effects of all ſtrong paſſions, hope or fear, love or anger, joy or ſorrow, exultation or deſpair. Theſe are certainly irrefragable arguments, that it is properly no other *than one and the ſame thing* that is ſubject to theſe affections, and that they are neceſſarily dependent upon one another. In fact, there is juſt the ſame reaſon to conclude, that the powers of ſenſation and thought are the neceſſary reſult of a particular organization, as that found is the neceſſary reſult of a particular concuſſion of the air. For in both caſes equally the one conſtantly accompanies the other; and there is not in nature a ſtronger

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(D) When Dr Prieſtley mentions the *extenſion* of corporeal ſubſtance, it muſt be remembered that he does not mean the extenſion of any real thing poſſeſſed of an independent exiſtence. The extenſion belongs wholly to the *ſphere* or the *combination* of ſpheres of *attraction* and *repulſion*. The centre itſelf, which attracts and repels, he repeatedly affirms not to have the dimenſions even of a phyſical point; and he ſometimes ſeems to entertain a doubt whether it be any thing more than a mere relative notion.

ſtronger argument for a neceſſary connection or any cauſe and any effect. To adopt an opinion different from this, is to form an hypotheſis without a ſingle fact to ſupport it." *

Though the ingenious author thinks, that if there be any foundation for the eſtabliſhed rules of philoſophiſing, this reaſoning ought to be concluſive, he yet ſubjoins, for the greater ſatisfaction of his readers, ſome additional arguments or rather, as he ſays, diſtinct illuſtrations of the great argument. They are as follows.

1. "That the faculty of thinking neceſſarily depends, for its *exerciſe* at leaſt, upon a ſtock of ideas, about which it is always converſant, will hardly be queſtioned by any perſon. But there is not a ſingle idea of which the mind is poſſeſſed but what may be proved to have come to it from the bodily ſenſes, or to have been conſequent upon the perceptions of ſenſe. The notion, therefore, of the *poſſibility* of thinking in man, without an organized body, is not only deſtitute of all evidence from actual appearances, but is directly contrary to them; and yet theſe appearances ought alone to guide the judgment of philoſophers.

2. "The only reaſon why it has been ſo earneſtly contended for, that there is ſome principle in man that is not material, is, that it might ſubſiſt, and be capable of ſenſation and action, when the body is dead. But if the mind was naturally ſo independent of the body, as to be capable of ſubſiſting by itſelf, and even of appearing to more advantage, after the death of the body; it might be expected to diſcover ſome ſigns of its independence before death, and eſpecially when the organs of the body were obſtructed, ſo as to leave the ſoul more at liberty to exert itſelf; as in a ſtate of *ſleep* or *ſwooning*, which muſt reſemble the ſtate of death; in which it is pretended that the ſoul is moſt of all alive, moſt active, and vigorous. But judging by appearances, the reverſe of all this is the caſe.

3. "If the mental principle was, in its own nature, immaterial and immortal, all its particular faculties would be ſo too; whereas we ſee that every faculty of the mind without exception is liable to be impaired, and even to become wholly extinct, before death. Since, therefore, all the faculties of the mind, ſeparately taken, appear to be mortal, the ſubſtance or principle in which they exiſt muſt be pronounced to be mortal too.

4. "If the ſentient principle in man be immaterial, it can have no *extenſion*; it can neither have length, breath, nor thickneſs; and conſequently every thing within it, or properly belonging to it, muſt be *ſimple* and *indiviſible*. Let us now conſider how this notion agrees with the phenomena of ſenſation and ideas. It will not be denied, but that ſenſations or ideas properly exiſt *in the ſoul*, becauſe it could not otherwiſe retain them, ſo as to continue to perceive and think after its ſeparation from the body. Now, whatever ideas are in themſelves, they are evidently produced by external objects, and muſt therefore correſpond to them; and ſince many of the objects or archetypes of ideas are diviſible, it neceſſarily follows, that the ideas themſelves are diviſible alſo. But, how is it poſſible that a thing (be the nature of it what it may) that is *diviſible*, ſhould be contained in a ſubſtance, be the nature of *it* likewiſe what it may, that is *indiviſible*? If the archetypes of ideas have extenſion, the ideas which are expreſſive of them, and are actually produced by them according to certain mechanical laws, muſt have extenſion likewiſe; and therefore the mind in which they exiſt, whether it be material or immaterial, muſt have extenſion alſo. But how any thing can have extenſion and yet be immaterial, without coinciding with our idea of mere empty *ſpace*, I know not."

To the argument, which is here chiefly inſiſted on as being agreeable to the eſtabliſhed rules of philoſophiſing, a very able reply has been made, which we ſhall give in the words of its elegant and ſpirited author. But before we attempt to dig up the foundation of the Doctor's ſyſtem, it may not be improper to demoliſh, if poſſible, the additional buttreſſes by which it is ſtrengthened. An experienced general, before he ſtorm a citadel which he knows to be ſtrongly fortified and ſkilfully defended, will take care to raze every leſs important redoubt from which the enemy might annoy him in his rear.

234 Anſwered.

Becauſe the faculty of thinking in general ripens, comes to maturity, and decays with the body, and the body on the other hand is affected by the affections of the mind, the Doctor affirms that we have the ſame reaſon to conclude, that the powers of ſenſation and thought are the neceſſary reſult of a particular organization, as that ſound is the neceſſary reſult of a particular concuſſion of the air. This argument is concluſive only upon the ſuppoſition that there is no *poſitive* evidence whatever for the immateriality of the being which is the ſubject of thought. If the other reaſonings for the materiality and immateriality of the mind be of equal weight, this argument ought doubtleſs to turn the balance; but if there be the ſmalleſt preponderancy in behalf of the immaterialiſts, it is a mere begging of the queſtion to attempt to counteract it by any inference which can be drawn from the mutual affections of the body and mind. If two ſuch heterogeneous beings as an immaterial mind and an organiſed body can be ſuppoſed united in one perſon, they muſt neceſſarily affect each other; and to affirm, on account of this reciprocal affection, that they are *one and the ſame*, is equally abſurd as to ſay that an electrician and his apparatus are *one and the ſame*. Dr Prieſtley himſelf did not at firſt perform his electrical experiments with ſo much eaſe as after he had acquired facility by long practice, nor could he even yet perform them ſo neatly with a bad as with a good apparatus.

That which the Doctor calls the firſt illuſtration of his argument might be admitted, and the force of the argument itſelf be conſiſtently denied. Some kind of organiſed body may be neceſſary to the mind as an inſtrument without which it could not exert its faculties; but it would certainly be raſh to infer that the mind muſt *therefore* be a ſyſtem of matter. An anvil and a hammer are neceſſary to the exerciſe of the blackſmith's art; but what would be thought of him who ſhould from this fact conclude, that the blackſmith himſelf muſt be a ſyſtem of iron? This, therefore, inſtead of illuſtrating the great argument, ſeems to be wholly foreign from the queſtion in debate; and it has in fact been admitted by Dr Price *, and thouſands of others who reject the doctrine of materialiſm, as an impious abſurdity. The ſecond illuſtration, however, is more to the purpoſe; and as it is not new, we ſhall give it an old anſwer.

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* Diſquiſitions on Matter and Spirit.

* Correſpondence with Dr Prieſtley.

Why do not we perceive external objects in our *ſleep* or in a *ſwoon?* "Becauſe (ſays Mr Wollaſton), † the *paſſages* are become impracticable, the *windows* ſhut, and the *nerves* being obſtructed, or ſomehow rendered for the time uſeleſs, can tranſmit no information to it. Why, however, does it not reaſon and think about *ſomething or other?* Becauſe, all the *marks* by which things are remembered, being for the preſent choked up or diſordered, the remembrance of thoſe *objects* about which it is wont to employ itſelf, and even of the words (or other ſigns) in which it uſes to reaſon, and to preſerve the deductions and concluſions it makes, is all ſuſpended at leaſt for the time; and ſo its tables being covered, its books cloſed, and its tools locked up, the requiſites for reaſoning are wanting, and no ſubject offers itſelf to exerciſe its thoughts, it having yet had little or no opportunity to take in *higher objects* and more *refined matter* for contemplation. And, to conclude, if it be demanded, Why any one ſhould imagine that the *ſoul* may think, perceive, act, *after death*, when it doth not do this in ſleep, &c.? the anſwer is, Becauſe thoſe *incloſures* and *impediments* which occaſioned the forementioned intermiſſions, and thoſe great limitations under which it labours at all times, will be removed with its enlargement out of the body. When it ſhall in its *proper vehicle* be let go, and take its flight into the open fields of heaven, it will then be bare to the immediate impreſſions of objects: And why ſhould not thoſe impreſſions which affected the *nerves*, that moved and affected the vehicle and ſoul in it, *affect the vehicle immediately* when they are immediately made upon it, without the interpoſition of the nerves? The hand which feels an object at the end of a *ſtaff*, may certainly be allowed to feel the ſame much better by *immediate contact* without the ſtaff."

† Religion of Nature Delineated.

The opinion, that the ſoul is united to ſome fine vehicle, which dwells with it in the brain, and goes off with it at death, was not peculiar to Mr Wollaſton. It was thought extremely probable by Dr Hartley, and ſhall be ſhown afterwards to have been a very ancient opinion; but we do not quote it at preſent as either well or ill founded, but only as ſufficient, in conjunction with the reaſoning of its author, to obviate the force of Dr Prieſtley's ſecond illuſtration of his argument for the materiality of mind, provided the argument itſelf be not more powerful than any which the immaterialiſts can bring againſt it.

The Doctor's third illuſtration we have already obviated, when we accounted for the mind and the body mutually affecting each other; and we might refer to Dr Price's anſwer (E) to the fourth, as being, in our opinion, a full confutation of it. But as that author's notions of *mind* and *ideas* differ in ſome reſpects from our own, we ſhall examine this objection to the doctrine of the immaterialiſts upon principles which we believe Dr Prieſtley more inclined to admit.

That the ſentient principle in man, if it be immaterial, can have no extenſion, is a truth which we think cannot be controverted; and if ſo, every thing in that principle muſt be *ſimple* and *indiviſible*. Thus far we agree with Dr Prieſtley; but with reſpect to what follows we differ from him entirely. The agitation in the brain, which is the immediate cauſe of ſenſation, muſt indeed correſpond to the impreſſion *ab extra* by which it is produced, and therefore muſt have the property of extenſion; but that agitation, whatever it be, is not itſelf ſenſation any more than a bludgeon is a blow or a ſword is a wound. Dr Prieſtley, indeed, in anſwer to Dr Price, affirms, that, according to Hartley's theory, ideas are only *vibrations in the brain;* but whoever ſhall take the trouble to examine that theory himſelf, will not find that its author ever advances ſuch an opinion, or conſiders vibrations as any thing more than the inſtruments by which ſenſations and ideas are excited in the ſentient principle. A real and proper idea, as we have often repeated, is nothing elſe than a fainter ſenſation: but no ſenſation, from whatever cauſe it may proceed, is itſelf extended; nor could we, without memory, the reaſoning faculty, and the power of local motion, have acquired from mere ſenſe any notion of extenſion at all:)See ſect. 3. chap. 1. Part I.)Senſations and ideas are thoſe *appearances* (if we may ſo ſay), which vibrations or ſome other motion in the brain excite in the mind; but a *half* appearance is an abſurdity. A man may view *half a tree* with his eyes, and he may contemplate the idea of *half a tree* in his mind; but he cannot have *half a view* or *half an idea* of any thing. Senſations and ideas reſult from the mutual agency of the brain and ſentient principle upon each other; and if the agency of the brain be vibration, more of it may vibrate at one time than at another: but ſurely the mere relation between its agency at any time and the agency of the mind, can neither have extenſion nor be diviſible; for who ever thought of extending or dividing relations? On this ſubject it is extremely difficult to write with perſpicuity and preciſion; and what we have ſaid may very poſſibly be miſunderſtood. Our notion is to ourſelves clear and determinate; but language which was not invented by metaphyſicians, wants words in which it may be properly expreſſed. Perhaps the reader may underſtand what we mean, when we ſay that a ſenſation or an idea is the inſtantaneous effect of the mutual agency of the brain and ſentient principle. Of this we think every man, by a little attention, may be perfectly convinced, though it may be impoſſible ever to diſcover the preciſe nature

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(E) In *Diſquiſitions*, p. 37 and 102, it is aſſerted, that ideas are certainly diviſible. "This ſeems to me very abſurd. It would be as proper to aſſert ideas to be hard or round. The idea of an object is the apprehenſion, view, or notion of it; and how can this be diviſible? Perception is a ſingle and indiviſible act. The object perceived may be diviſible; but the *perception* of it by the mind cannot be ſo. It is ſaid in page 95, *that if ideas are not things diſtinct from the mind, a mind with ideas and a mind without ideas would be the ſame.*—I maintain, that ideas are not diſtinct from the mind, but its conceptions; or not *things* themſelves, but *notions* of things. How does it follow from hence, that a mind with or without ideas is the ſame? It would ſeem that this follows much more from the contrary aſſertion." *Correſpondence between Dr Price and Dr Prieſtley.*

ture of this agency; and if ſo, it is plain that ſenſations and ideas cannot be divided, for no inſtantaneous effect of any kind is diviſible. A ſenſation, and of courſe a ſimple and original idea, neither has extenſion itſelf, nor ſuggeſts the notion of extenſion *ab extra*. By running the hand or any other member along a ſolid body, we feel continued reſiſtance: this feeling, or the idea of this feeling, becomes in time ſo cloſely aſſociated with all our ſenſations of touch and ſight, that the one cannot be ſeparated from the other; and theſe aſſociations are what Dr Prieſtley calls *extended ideas*. Upon the whole then, we think it apparent, that our ſenſations, and the relicts of our ſenſations, are unextended and indiviſible, (r); and that though they ſuggeſt to us the exiſtence of extended things *ab extra*, the ſentient being *may* be unextended and indiviſible.

Having thus examined Dr Prieſtley's auxiliary arguments for the materiality of mind, we now proceed to conſider his main and direct proof. To this, as we have obſerved, ſo able a reply has been made, that it would be injuſtice to our readers not to lay it before them, in the words of its author. "I readily acknowledge (ſays this ſpirited eſſayiſt*), that the power of ſenſation or perception never having been found but in conjunction with a certain organiſed ſyſtem of matter, we ought, as philoſophers, to conclude that this power neceſſarily exiſts in, and reſults from, that organiſed ſyſtem, unleſs it can be ſhown to be incompatible with other known properties of the ſame ſubſtance. On the other hand it muſt be admitted, that conſtant conjunction implies *neceſſary* connection only when reaſons cannot be diſcovered to prove the conjunction to be accidental and arbitrary. In the preſent inſtance, it is alleged, that diſcerptibility is a property of matter abſolutely incompatible with the property of ſenſation or perception; or in other words, that ſenſation is a power or property incapable of diviſion. But as the power of the entire ſyſtem is clearly nothing more than the ſum or aggregate of the powers of all the parts, it neceſſarly follows, that the primary particles of which the ſyſtem is compoſed muſt, upon the material hypotheſis, poſſeſs diſtinct powers of ſenſation; and that thoſe

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Direct proof that the ſentient principle in man cannot be a ſyſtem of matter.

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* Eſſays Philoſophical, Hiſtorical, and Literary vol. ii.

(r) We affirm this only of *human* ſenſations and ideas, becauſe theſe are the only ſenſations and ideas of which we are conſcious, and about which we can reaſon. Other animals are ſentient as well as man, and appear to have their ſenſations excited by impreſſions *ab extra*; but whether in every ſpecies of animals a ſingle impreſſion excites but one ſenſation common to the whole animal, or different ſenſations which are felt each by a different faculty or ſentient principle, is a queſtion which we are not able to anſwer. We make this remark, becauſe from the phenomena of ſenſation in the earth-worm, and other reptiles, ſome philoſophers of eminence having ſuppoſed, that in theſe creatures the ſentient faculty belongs to the material ſyſtem, and is diviſible with it; have thence concluded, we think raſhly, that all arguments for the immateriality of the human mind are founded merely on our ignorance. We call this concluſion raſh; becauſe, though we know perfectly what a human ſenſation is, we have ſo little knowledge of the nature of ſenſation in worms, that what may be true of the one *principle* of ſenſation may be falſe of the other. Indeed, if we are to judge from the phenomena, this is actually the caſe. It appears from experiments made by Abbé Spallanzani and others, that if a certain number of rings be cut off either from the anterior or poſterior part of a worm, or even from both, the remainder will not only continue to live and be ſentient, but will alſo regenerate a new head and a new tail, and become again a complete worm. Nothing like this takes place in man or in the higher orders of animals; and therefore, were it certain that the ſentient principle in the worm is diffuſed through the whole ſyſtem and diviſible with it, we could not infer that the principle of ſuch ſenſations as we are conſcious of, is likewiſe extended and diviſible. It is, however, ſo far from being certain that the ſentient principle is diffuſed through the whole worm, that nothing neceſſarily follows from this fact but that its ſeat is at ſome diſtance from either extremity. Nay, were it true, as perhaps it is, that a worm may be ſo divided, as that each of the two ſections ſhall retain life, ſenſation, and this reproductive power, we would not therefore be authoriſed to conclude that the ſentient principle is *one*, co-extended and diviſible with the material ſyſtem. The earth-worm, like many other reptiles, being an hermaphrodite, which unites in itſelf both ſexes, may poſſibly conſiſt of two animated ſyſtems; which though united by ſome bond of connection, by which ſenſation is communicated from the one to the other, are yet in themſelves perfectly diſtinct. Should this, upon proper inveſtigation, be found to be the caſe; and ſhould it likewiſe be found, that when a worm is divided into three or more parts, only one or two of theſe parts continue to live, there would be no room whatever for ſuppoſing that even in theſe creatures the principle of ſenſation is extended and diviſible. In the mere power of reproducing amputated parts, when that power is conſidered by itſelf, there is nothing more wonderful than in the growing of the nails of our fingers or the hairs of our heads. The only thing which ſeems to militate againſt the ſimplicity of the principle of ſenſation in worms, is the continuance of life, &c. with both parts of a worm when cut into two by a knife or pair of ſciſſars; but if a worm be found to have two ſeats of ſenſation analogous to the brain in higher animals, and if it be likewiſe found that life continues only in ſuch ſections as retain at leaſt one ſeat of ſenſation, the ſentient principle in the worm may be as ſimple and indiviſible as in any animal whatever. We neither wiſh nor expect much ſtreſs to be laid upon theſe hints and conjectures. Should they induce any of our phyſiological readers, who have leiſure, and are at the ſame time ſkilled in philoſophy, properly ſo called, to inſtitute a ſet of experiments upon worms, and ſuch reptiles, and to trace apparent effects to their higher cauſes, they might eventually lead to important diſcoveries. In the mean time, it is ſufficient for our purpoſe to obſerve, that whatever be the ſentient principle or principles in the earth-worm, it is obvious that the whole animal cannot in any caſe be conſcious as man undoubtedly is, of *one individual ſenſation*; and that therefore no arguments built upon the phenomena accompanying ſenſation in worms, can be of any importance in the controverſy about the materiality or immateriality of the human mind.

Of the Subſtance of the Human Mind.

thoſe powers combined conſtitute the indiviſible power of ſenſation belonging to the ſyſtem; or, in other words, that the *indiviſible* power of ſenſation is a *diviſible* power, nay, an infinitely diviſible power, if matter be, as philoſophers in general allow, an infinitely diviſible ſubſtance—a concluſion obviouſly and groſsly ridiculous. We are then compelled to acknowledge, that ſenſation or perception is not the property of a material ſubſtance; *i. e.* if the common mode of expreſſion be retained, it is the property of an immaterial ſubſtance; or to avoid verbal contention, it is a property not reſulting from, or neceſſarily connected with, the organical ſyſtem, but a property wholly foreign, ſuperinduced, and adventitious. (G)

"In oppoſition to this reaſoning, the materialiſts affirm, that entire ſyſtems may poſſeſs, and they think themſelves warranted to pronounce that organized ſyſtems of matter actually do poſſeſs, powers eſſentially different from thoſe which inhere in the ſeveral parts. Amongſt various familiar though ſtriking illuſtrations of this truth, it has been ſaid, that a roſe poſſeſſes the property of ſweetneſs or fragrance, a globe the property of ſphericity, a harpſicord the property or power of producing harmony, *aqua regia* the property of diſſolving gold, &c. though the component particles of theſe different organized ſyſtems are themſelves totally deſtitute of the powers and properties here enumerated.

"The immaterialiſts, in reply, aſſert, that it is not only falſe in fact, but a direct contradiction, and an abſolute impoſſibility in the nature of things, that a ſyſtem ſhould poſſeſs any property which does not inhere in its component parts. To aſſert that the power of the whole is the ſum or aggregrate of the powers of all the parts, is an identical and ſelf-evident propoſition, the whole and all the parts being terms preciſely ſynonymous. Whoever, therefore, calls in queſtion the truth of this axiom, muſt maintain that the power of the whole is ſomething different from the power of all the parts, *i. e.* that the power of the whole is *not* the power of the whole.

Of the Subſtance of the Human Mind.

"It will be eaſy to demonſtrate the correſpondence of facts with this plain and ſimple theory. For this purpoſe, it is neceſſary to obſerve, that the properties of matter, or what are generally denominated ſuch, may be divided into real and nominal, which Locke and others have called primary and ſecondary qualities. Figure, magnitude, and motion, are qualities really inherent in matter; but figure, magnitude, and motion, eternally varied, can produce only different combinations of figure, magnitude, and motion. There are alſo powers, or qualities, vulgarly conſidered as inherent properties of matter organically diſpoſed, which are really and truly qualities or affections of the mental or percipient principle, and have no exiſtence when not perceived. Thus the ſweetneſs or fragrance of the roſe, conſidered as mere ſweetneſs and fragrance, can be nothing but an affection of the mind; conſidered as a quality of the roſe, they can mean nothing more than a certain arrangement, configuration, and motion of parts, which in ſome inexplicable manner produces the ſenſation of ſweetneſs. In this inſtance, therefore, the power of the whole is plainly the aggregate of the powers reſiding in the parts, by the motion and organization of which a certain effect is produced upon a foreign and percipient ſubſtance.

"But a globe, we are told, poſſeſſes the property of ſphericity, though not a ſingle particle amongſt that infinite number of which the globe is conſtituted is itſelf of a ſpherical form. The fallacy of

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(G) This argument is not new. It was long ago urged by Dr Clarke againſt Mr Dodwell; and ſome of our readers may not be ill pleaſed to ſee it ſtated by ſo maſterly a reaſoner: "That the ſoul cannot poſſibly be *material*, is demonſtrable from the ſingle conſideration of bare ſenſe or conſciouſneſs. For matter being a diviſible ſubſtance, conſiſting always of ſeparable, nay of actually ſeparate and diſtinct parts, it is plain that unleſs it were eſſentially conſcious, in which caſe every particle of matter muſt conſiſt of innumerable ſeparate and diſtinct conſciouſneſſes, no ſyſtem of it, in any poſſible compoſition or diviſion, can be an individual conſcious being. For ſuppoſe three or three hundred particles of matter, at a mile or any given diſtance one from another, is it poſſible that all theſe ſeparate parts ſhould in that ſtate be one individual conſcious being? Suppoſe then all theſe particles brought together into one ſyſtem, ſo as to touch one another, will they thereby, or by any motion or compoſition whatſoever become one whit leſs truly diſtinct beings than they were when at the greateſt diſtance How then can their being diſpoſed in any poſſible ſyſtem make them one individual conſcious being? If you will ſuppoſe God by his infinite power ſupperadding conſciouſneſs to the united particles, yet ſtill theſe particles being really and neceſſarily as diſtinct beings as ever, cannot be *themſelves* the *ſubject* in which that individual conſciouſneſs inheres; but the conſciouſneſs can only be ſuperadded by the addition of ſomething, which in all the particles muſt ſtill itſelf be but one individual being. The ſoul, therefore, whoſe power of thinking is undeniably one individual conſciouſneſs, cannot poſſibly be a material ſubſtance." *Clarke's Letter to Mr Dodwell, 2d edition.*

That the ſame mode of reaſoning was known to the ancients, Cudworth has ſhown by numerous quotations; and as an argument certainly loſes nothing by antiquity, or by having occurred to thinking men in diſtant ages, we ſhall lay before our readers two paſſages from Plotinus, of which the extract from Clarke's letter (though we are perſuaded it was not borrowed by the author) muſt be conſidered as little more than a paraphraſtical tranſlation. ——τι τοινυν φησουσιν, ὁι την ψυχην σωμα ειναι λεγοντεσ, πρωτον μεν περι ἑκαστου μερους της ψυχης τησ εν τω αυτω σωματι, ποτερον ἑκαστον ψυχην, ὁια εστι και ἡ ὁλη; και παλιν του μερους το μερος; ουδεν αρα το μηγεθος συνεβαλλετο τη ουσια αυτης· καιτοι εδειγε ποσου τινος οντος· αλλα και ὁλον πολλα χη, οπερ σωματι παρειναι αδυνατον, εν πλειοσι το αυτο ὁλον ειναι, και το μερος ὁπερ το ὁλον, ὑπαρχειν· ει δε ἑκαστον των μερων, ου ψυχη φησουσιν, εξ αψυχων ψυχη αυτοις υπαρξει. *En.* IV. *Lib. 7timo. Cap.* 5.

The ſame argument is elſewhere ſtated thus: ει δε ἑκαστον ζωην εχοι, και εν αρχει· ει δε μηδενος αυτων ζωην εχοντος ἡ συνοδος πεποιηκε ζωην, ατοπον· μαλλον δε αδυνατον συμφορησιν σωματων ζωην αργαζεθαι, νουν γενναν τα ανοητα. *En.* IV. *Lib.* 7. *Cap.* 2.

of this illuſtration is, however, as eaſily demonſtrable as that of the former. The ſphericity of a globe is evidently the ſum or aggregate of the curvilinear or convex parts which compoſe its ſurface; and the property of the whole is neither more nor leſs than the combined properties of all its parts. No one doubts, that by new compoſitions or arrangement of material particles poſſeſſing magnitude, figure, and motion, an endleſs diverſity of phenomena may be produced, to which it may be neceſſary to apply new names. New names, however, do not conſtitute new properties; and though we give to a globe the appellation of an entire ſyſtem, and aſcribe to it the property of ſphericity, we know at the ſame time that it is really nothing more than a collection of thouſands of millions of particles, actually ſeparate and diſtinct, arranged in that particular form which we denominate ſpherical. But this can never be regarded as in the remoteſt manner analogous to the *creation* of the power of perception, in conſequence of a certain organical arrangement or diſpoſition of impercipient particles. Though ſphericity is, indeed, the property of the entire ſphere, yet every part of the ſphere, if divided, poſſeſſes its ſhare of ſphericity. But if the percipient principle be divided, what would become of the power of perception? A ſphere equally divided becomes two hemiſpheres; does a perception, when divided in like manner, become two demi-perceptions?

"The ſame reaſonings may eaſily be transferred, and applied to the harpſichord. Can any one be abſurd enough to affirm that the power of harmony reſides in the harpſichord, as the power of perception does in the mind? After the utmoſt ſkill of the artificer has been exerted, we diſcover nothing more in the harpſichord than new modifications of the old properties of figure, magnitude, and motion, by means of which certain vibrations are communicated to the air, which conveyed by the medium of the auditory nerves to the ſenſorium, produce the ſenſation of harmonic ſounds. Theſe new modifications are therefore attended, indeed, with new and very wonderful effects; but then thoſe effects are produced upon, and are themſelves modifications of the ſentient or percipient faculty. And though it is wholly incomprehenſible to us in what manner theſe effects, that is, theſe *ſenſations*, are produced, we well know, and perfectly comprehend, that they are not new powers belonging to any organized ſyſtem of matter; that they have no exiſtence but in a mind perceiving them; and that they are far from militating againſt that grand and univerſal axiom, that the power of the whole is nothing more than the united powers of all the parts.

"As to the laſt inſtance adduced, of the power of *aqua regia* to diſſolve gold, though neither the ſpirit of ſalt, nor the ſpirit of nitre of which it is compounded, ſeparately poſſeſſes that power, it is plain, that from the union of theſe two ſubſtances, certain new modes of configuration and motion reſult; and the ſolution of gold is the conſequence of this new arrangement and motion of the parts. But the particles of which the menſtruum is compoſed were always poſſeſſed of the properties of figure and motion; and what is ſtyled a new property, is clearly nothing more than a new effect of the old properties differently modified. In a word, the advocates for materialiſm may ſafely be challenged to produce, in the whole compaſs of nature, a caſe which bears the leaſt analogy to that which theſe inſtances are moſt unphiloſophically adduced to prove and to illuſtrate. It is an abſurdity which tranſubſtantiation itſelf does not exceed, to maintain that a whole is in reality any thing different from its component parts; and all nature riſes up in confutation of an aſſertion ſo monſtrous and extravagant. To affirm that perception can ariſe from any combination of impercipient particles, is as truly ridiculous, as to affirm that a combination of the ſeven primary colours with the four cardinal virtues may conſtitute a planet. It is equivalent to an aſſertion, that an epic poem might be compoſed of parallelograms, cones, and triangles. In a word, it is an abſurdity not leſs real, and little leſs obvious, than that of the blind man who thought that the idea of a ſcarlet colour reſembled the ſound of a trumpet."

If matter be taken in the common acceptation, to be a ſolid, extended, and inert ſubſtance, this reaſoning for the immateriality of the ſentient principle in man appears to us to have the force of demonſtration, which no difficulties or partial objections, ariſing from our inability to conceive the bond of union between two ſuch heterogeneous ſubſtances as mind and body, can ever weaken, and far leſs overturn. But the modern materialiſts deny that matter is either ſolid or inert.

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Reply by the materialiſts ſhown

"All theſe facts (ſay they) which led philoſophers to ſuppoſe that matter is impenetrable to other matter, later and more accurate obſervations have ſhown to be owing to *ſomething elſe* than ſolidity and impenetrability, viz. a *power of repulſion*, which for that reaſon they would ſubſtitute in its place. The property of *attraction* or repulſion (ſays Dr Prieſtley), appears to me not to be properly what is *imparted* to matter, but what really *makes it to be what it is*; inſomuch, that without it, it would be nothing at all; and as other philoſophers have ſaid,—'Take away ſolidity, and matter vaniſhes,' ſo I ſay, 'Take away attraction and repulſion, and matter vaniſhes.' If this be admitted, the ingenious author hopes that we ſhall not conſider matter with that contempt and diſguſt with which it has generally been treated, there being nothing in its real nature that can juſtify ſuch ſentiments reſpecting it.

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to be abſurd.

We know not why, upon any hypotheſis, matter ſhould be viewed with contempt and diſguſt.—Whether penetrable or impenetrable, every conſiſtent theiſt conſiders it as one of the creatures of God perfectly fitted to anſwer all the purpoſes for which it was intended: but were it really deſtitute of ſolidity, and endowed with the powers of attraction and repulſion, we ſhould ſtill be obliged to conſider it as incapable of the powers of ſenſation and thought. If we have any notion at all of what is meant by centres of attraction and repulſion (of which indeed we are far from being confident), it appears to us to be intuitively certain, that nothing can be the reſult of any poſſible combination of ſuch centres, but new and more enlarged ſpheres of attraction and repulſion. But ſurely conſciouſneſs, ſenſation, and will, are as different from attraction and repulſion, as a cube is from the ſound of a trumpet, or as the ſenſations of a felon in the agonies of death are from the attraction of the rope by which he is hanged. If this be admitted, and we are perſuaded it will be denied by no man whoſe underſtanding is not clouded by an undue attachment to paradoxes, the ſentient principle cannot poſſibly be matter: for if, when the powers of attraction and repulſion are taken away, matter vaniſhes; and if conſciouſneſs and ſenſation are not attraction and repulſion; it is not more evident that three and two are not nine, than that the ſubſtance which attracts and repels cannot be that which is conſcious and percipient.

238 Locke's opinion haſty and illfounded.

Locke, who was certainly no materialiſt, as he repeatedly affirmed, and indeed demonſtrated, that thought could never be the reſult of any combinations of figure, magnitude, and motion, was yet of opinion, that God by his almighty power might endow ſome ſyſtems of matter with the faculties of thinking and willing. It is always with reluctance that we controvert the opinions of ſo great a man; and it is with ſome degree of horror that we venture in any caſe to call in queſtion the power of Omnipotence.—But Omnipotence itſelf cannot work contradictions; and it appears to us nothing ſhort of a contradiction, to ſuppoſe the individual power of perception inhering in a ſyſtem which is itſelf extended and made up of a number of ſeparate and diſtinct ſubſtances. For let us ſuppoſe ſuch a ſyſtem to be ſix feet long, three feet broad, and two feet deep (and we may as well ſuppoſe a ſyſtem of theſe dimenſions to be percipient, as one that is ſmaller), then it is plain, that every idea muſt be extended, and that part of it muſt be in one place, and part in another. If ſo, the idea of a ſquare inch will be ſix feet long, three feet broad, and two feet deep; and what is ſtill harder to be digeſted, the ſeveral parts of this idea will be at a great diſtance from each other, without any bond of union among them. The being which apprehends one extremity of the idea, is, by the ſuppoſition, ſix feet diſtant from the being which apprehends the other extremity; and though theſe two diſtinct beings belong to one ſyſtem, they are not only ſeparable, but actually ſeparated from each other as all the particles of matter are. What is it then that apprehends as *one* the whole of this extended idea? Part of it may be apprehended by one particle of matter, and part of it by another; but there is nothing which apprehends, or can apprehend, the whole. Perhaps it will be ſaid, the power of apprehenſion is not divided into parts, but is the power of the one ſyſtem, and therefore apprehends at once the whole idea. But a power or faculty cannot be ſeparated from its ſubject, power which inheres in nothing being confeſſedly impoſſible; and a material ſyſtem is not *one ſubject* in which any individual power or faculty can inhere. There muſt, therefore, be united to the ſyſtem ſome *one* being, which is the ſubject of thought, and which is unextended as well as indiviſible. This, we ſay follows undeniably. For, let us ſuppoſe, that an extended being without ſeparable parts is poſſible, and that ſuch a being is percipient; it is obvious, that the whole of any one of its perceptions could not be in one place. Now, though we ſhould grant to Dr Prieſtley and other materialiſts, that every idea of an extended ſubſtance has itſelf three dimenſions, and is incorporated and commenſurate with the whole percipient ſyſtem; what, upon this ſuppoſition, ſhall we think of conſciouſneſs and of the perception of truth? Is conſciouſneſs or truth extended? If ſo, one ſide or ſuperficies of conſciouſneſs, or of a truth, may be greater or leſs than another, above or below, to the right or to the left; and it will be very proper and philoſophical to ſpeak of the length, breadth, and depth, of conſciouſneſs or of truth. But ſurely to talk of the place, or the extenſion of theſe things, is as abſurd as to talk of the colour of ſound, or the ſound of a triangle; and we might as well ſay, that conſciouſneſs is green or red, as that it is an ell or an inch long; and that truth is blue, as that it has three dimenſions.

239 becauſe the ſentient being cannot be extended.

This reaſoning is ſomewhat differently ſtated by Cudworth; who obſerves, that if the ſoul be an extended ſubſtance, "it muſt of neceſſity be either a phyſical point (*i. e.* the leaſt extenſion poſſible, if there be any ſuch leaſt extenſion), or elſe it muſt conſiſt of more ſuch phyſical points joined together. As for the former of theſe, it is impoſſible that *one ſingle atom*, or *ſmalleſt point* of extenſion, ſhould be able to perceive diſtinctly all the *variety* of things, *i. e.* take notice of all the *diſtinct* and *different* parts of an *extended object*, and have a *deſcription* or *delineation* of the whole of them upon itſelf (for that would be to make it the leaſt, and not the leaſt, poſſible extenſion at the ſame time:) Beſides, to ſuppoſe every ſoul to be but one *phyſical point*, or the ſmalleſt *poſſible extenſion*, is to ſuppoſe ſuch an eſſential difference in matter or extenſion, as that ſome of the *points* thereof ſhould be *naturally* devoid of all *life*, *ſenſe*, and *underſtanding*; and others, again, naturally *ſenſitive* and *rational*. And even ſhould this abſurdity be admitted, it would yet be utterly inconceivable how there ſhould be *one*, and *but* one, *ſenſitive* and *rational* atom in every man; how this atom of ſo *ſmall* dimenſions ſhould actuate the whole ſyſtem; and how it ſhould conſtantly remain the ſame from infancy to old age, whilſt all the other parts of the ſyſtem tranſpire perpetually, and are ſucceeded by new matter (H).

"But if, according to the ſecond hypotheſis, ſouls be

(H) Should it be ſaid, that this eſſential difference between the atoms of matter is not fortuitous; that ſome of them are created intelligent for the expreſs purpoſe of animating ſyſtems of others which are unintelligent; and that theſe intelligent atoms do not operate upon the ſyſtems with which they are united, by the *vis inertiæ*, *ſolidity*, or *extenſion*, of matter, but by the energies of underſtanding and will: Should this (we ſay) be alleged, ſurely it may be aſked, for what purpoſe they are conceived to have the quality of extenſion? It is evidently of no uſe; and it has been already ſhown, and ſhall be more fully ſhown afterwards, that by our notions of conſciouſneſs and underſtanding, we are ſo far from being led to ſuppoſe the ſubject of theſe powers extended, that we cannot ſuppoſe any relation whatever between them and extenſion. But if theſe intelligent atoms be diveſted of their quality of extenſion, they will be transformed from matter to mind, and become the very things for the exiſtence of which we plead.

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be extended ſubſtances conſiſting of many points one without another, and all concurring in every ſenſation; then muſt every one of theſe points perceive either a *point* only of the object, or elſe the *whole*. Now, if every *point* of the *extended ſoul* perceives only a *point* of the *object*, then is there no *one thing* in us that perceives the whole, or that can compare one part of the object with another. On the other hand, if every *point* of the *extended ſoul* perceive the *whole object* at once, then would there be *innumerable perceptions* of the ſame object in every ſenſation; as many, indeed, as there are points in the extended ſoul—And from both theſe ſuppoſitions it would alike follow, that no man is *one ſingle percipient* or perſon, but that in every man there are innumerable diſtinct *percipients* or *perſons*; a concluſion directly contrary to the infallible evidence of conſciouſneſs (1)."

Cogent as theſe arguments for the immateriality of the ſentient principle appear to be, they have been lately treated with the moſt ſovereign contempt by a writer who profeſſes to be a diſciple of Dr Prieſtley's, but who ſeems not to have learned the modeſty or the candor of his maſter. Dr Prieſtley labours to prove, that to account for the phenomena of perception and volition, &c. it is not neceſſary to ſuppoſe an immaterial principle in man. Mr Cooper with greater boldneſs affirms, and undertakes to demonſtrate with all the parade of mathematical preciſion ‡, that ſuch a principle is impoſſible. Though the authority of this philoſopher in ſuch inquiries as depend not immediately upon the retort and the furnace, is certainly not great, he yet utters his dogmas with ſuch confidence, that it may not be improper to examine the chief arguments upon which they reſt.

‡ Tracts Ethical, Theological, and Political, Vol. I.

240 An attempt to prove the impoſſibility of immaterial ſubſtance

"Suppoſe (ſays he) the ſoul to have no common property with matter; then, nothing can act upon any other but by means of ſome common property. Of this we have not only all the proof that induction of known and acknowledged caſes can furniſh, but that additional proof alſo which ariſes from the impoſſibility of conceiving how the oppoſite propoſition *can* be true. But by the ſuppoſition, the ſoul has no property in common with matter; and therefore the ſoul cannot act upon matter. But by the ſuppoſition of every ſyſtem of immaterialiſm (except thoſe of Malbranche, Berkeley, and Leibnitz), it is deemed an eſſential property of the ſoul, that it acts upon the body, or upon matter; therefore the ſoul can and cannot act upon matter at the ſame time, and in the ſame reſpect. But this is a contradiction in terms; and as two contradictions cannot both be true at the ſame time, the ſuppoſition of the exiſtence of an immaterial ſoul cannot be true: that is, the ſoul does not exiſt."

241 ſhown to be futile.

This reaſoning, the reader will obſerve, is carried on with all the pomp of mode and figure. The propoſitions hang upon each other like the ſeveral ſteps of an algebraic proceſs: but as in ſuch proceſſes one error unwarily admitted produces a falſe reſult, ſo in demon-

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(1) As the materialiſts endeavour to prejudice the public againſt the notion of an unextended ſoul, by repreſenting it as a fiction of *Des Cartes*, altogether unknown to the ancients, it may not be improper to give our readers an opportunity of judging for themſelves how far this repreſentation is juſt—*Plotinus*, reaſoning about the nature of the ſoul from its energies of ſenſation, expreſſes himſelf in theſe words:—ειτι μελλει αισθανεσθαι τινος, ἑν αυτο δει ειναι, και τω αυτω παντος αντιλαμβανεσθαι και ει δια πολλων αισθητηριον πλειω τα εισιοντα, η πολλαι περι ἑν ποιοτητες και δι ἑνος ποικιλον, ὁιον προσωπον· ου γαρ αλλο μεν ρινος αλλο δε οφθαλμων, αλλα ταυτον ὁμου παντων· και ει το μεν δι ομματων το δε δι ακοης, ἑν τι δει ειναι εις ὁ αμφω· η πως αν ειποι ὁτι ἑτερα ταυτα, μη εις το αυτο ὁμου των αισθησεων ελθον των. "That which perceives in us, muſt of neceſſity be one thing, and by one and the ſame indiviſible perceive all; and that whether they be more things entering through ſeveral organs of ſenſe, as the many qualities of one ſubſtance, or one various and multiform thing, entering through the ſame organ, as the countenance and picture of a man. For it is not one thing in us that perceives the noſe, and another thing the eyes, but it is one and the ſelf-ſame thing that perceiveth all. And when one thing enters through the eyes, another through the ears, both theſe alſo muſt of neceſſity come at laſt to one indiviſible; otherwiſe they could not be compared together, nor one of them be affirmed to be different from the other, the ſeveral ideas of them meeting no where in one place." Purſuing the ſame argument, and having obſerved, that if what perceiveth in us be extended, then one of theſe three things muſt of neceſſity be affirmed, that either every part of this extended ſoul perceives a part only of the object, or every part of it the whole object; or elſe, that all comes to ſome one point, which alone perceives both the ſeveral parts of the object aud the whole: he obſerves of the firſt of theſe ſuppoſitions,—μεγεθει οντι τουτω, ξυμμεριζοιτο αν· ωστε αλλο αλλου μερος, και μηδενα ἡμων ὁλου του αισθητου αντιληψιν εχειν· ὡσπερ αν ει εγω μεν αλλου· συ δε αλλου αισθοιο: "If the ſoul be a magnitude, then muſt it be divided, together with the ſenſible object, ſo that one part of the ſoul muſt perceive one part of the object, and another another; and nothing in it, the whole ſenſible; juſt as I ſhould have the ſenſe of one thing, and you of another." Of the ſecond ſuppoſition, he writes in this manner: ει δε ὁτιουν παντος αισθησεται· εις απειρα διαιρεισθαι του μεγεθους πεφυκοτος, απειρους και αισθησεις καθ εκαστον αισθητον συμβησεται γιγνεσθαι ἑκαστω ὁιον του αυτου απειρους εν τω ἡγεμονουντι ἡμων εικονος: "But if every part of the extended ſoul perceive the whole ſenſible object, ſince magnitude is infinitely diviſible, there muſt be in every man infinite ſenſations and images of one object."—And as for the third and laſt part of this disjunction, Plotinus by aſſerting the infinite diviſibility of body, here ſhows that the ſuppoſition of any one phyſical point is in itſelf an abſurdity. But if it were not, he agrees with Ariſtotle in aſking πως τω αμερει το μεριστον·—thereby plainly indicating, that the ſentient principle is totally ſeparated from extenſion, and can neither be conſidered as extended like a ſuperficies or ſolid, nor unextended as a phyſical point.

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demonſtrative reaſonings one unſound argument admitted into the premiſſes is neceſſarily productive of error in the concluſion. When the author affirms, "that nothing can act upon any other but by means of ſome common property," he affirms without the ſhadow of proof what is certainly not ſelf-evident. He ſays, indeed, that of this we have all the proof that induction of known and acknowledged caſes can furniſh; but unleſs conſciouſneſs be calculated to deceive us, this is unqueſtionably a miſtake. Matter, he repeatedly affirms, has no other properties than thoſe of attraction and repulſion: but a man moves his arm by a mere energy of will; and therefore, according to this demonſtrator, an energy of will muſt be either material attraction or material repulſion. If ſo, it is reaſonable to conclude, that when a man draws his hand towards his head, the centre of his brain exerts its power of *attraction*; and that when he extends his arm at full length before him, the ſame centre exerts its power of *repulſion*. We beg pardon of our readers for detaining them one moment upon ſuch abſurdities as theſe: yet we cannot diſmiſs the argument without taking the liberty to aſk our all-knowing author, How it comes to paſs that the ſame centre ſometimes attracts and ſometimes repels the ſame ſubſtance at the ſame diſtance; nay, that it both attracts and repels ſubſtances of the ſame kind, at equal diſtances, and at the very ſame inſtant of time? This muſt be the caſe, when a man puts one hand to his head, and thruſts another from him; and therefore, if theſe operations be the effect of attraction and repulſion, it muſt be of attraction and repulſion, to which induction of known and acknowledged caſes furniſhes nothing ſimilar or analogous, *i. e.* of ſuch attraction and repulſion as, according to Mr Cooper's mode of reaſoning, does not exiſt. The truth is, that we are not more certain that we ourſelves exiſt, than that an energy of will is neither attraction nor repulſion, and therefore, unleſs all matter be endued with will, it is undeniable, that, whatever be the ſubſtance of the ſoul, one thing acts upon another by a property not common to them both. In what *manner* it thus acts, we pretend not to know: but our ignorance of the *manner* of any operation is no argument againſt the *reality* of the *operation itſelf*, when we have for it the evidence of conſciouſneſs and daily experience; and when the author ſhall have explained to general ſatisfaction how material centres attract and repel each other at a diſtance, we ſhall undertake to explain how one thing acts upon another with which it has no common properties.

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A ſecond attempt of the ſame kind

Suſpicious, as it ſhould ſeem, that this reaſoning has not the complete force of mathematical demonſtration, the author ſupports his opinion by other arguments. "Whatever we know, (ſays he), we know by means of its properties, nor do we in any caſe whatever certainly know any thing but theſe; and we infer in all caſes the exiſtence of any thing which we ſuppoſe to exiſt from the exiſtence of its properties. In ſhort, our idea of any thing is made up of a combination of our ideas of its properties. Gold is heavy, ductile, tenacious, opake, yellow, ſoluble in *aqua regia*, &c. Now, let any one ſuppoſe for an inſtant that gold is deprived of all theſe, and becomes neither heavy, ductile, tenacious, opake, yellow, ſoluble, &c. what remains, will it be gold? Certainly not. If it have other properties, it is another ſubſtance. If it have no properties remaining, it is nothing. For nothing is that which hath no properties. Therefore, if any thing loſe all its properties, it becomes nothing; that is it loſes its exiſtence. Now, the exiſtence of the ſoul is inferred, like the exiſtence of every thing elſe, from its ſuppoſed properties, which are the phenomena of thinking, ſuch as perception, recollection, judgment, and volition. But in all caſes of *perfect* ſleep, of the operation of a ſtrong narcotic, of apoplexy, of ſwooning, of drowning where the vital powers are not extinguiſhed, of the effects of a violent blow on the back part of the head, and all other leipothymic affections, there is neither perception, recollection, judgment, nor volition; that is, all the properties of the ſoul are gone, are extinguiſhed. Therefore, the ſoul itſelf loſes its exiſtence for the time. If any man ſhall ſay that theſe properties are only *ſuſpended* for the time, I would deſire him to examine what idea he annexes to this ſuſpenſion; whether it be not neither more nor leſs than that *they are made not to exiſt for the time*. Either no more is meant, or it is contradictory to matter of fact; and moreover, if more *be* meant, it may eaſily be perceived to involve the archetypal exiſtence of abſtract ideas, and to contradict the axiom, *impoſſibile eſt idem eſſe et non eſſe*."

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Shown to be equally weak.

For the benefit of ſhort-ſighted inquirers, it is to be wiſhed that the author had favoured the public with this *proof* which might have been ſo eaſily brought; for we can diſcern no connection whatever between the ſuſpenſion of the exerciſe of the powers of the mind, and the archetypal exiſtence of abſtract ideas, or the abſurd propoſition that it is *poſſible for the ſame thing to be and not be*. We think, however, that we underſtand enough of this reaſoning which he has given us to be able to pronounce with ſome confidence that it is nothing to the purpoſe. For, in the *firſt* place, we beg leave to obſerve, that between the properties of gold and the powers of thinking, &c. there is no ſimilarity; and that what may be true when affirmed of the one, may be falſe when affirmed of the other. The powers of the mind are all more or leſs active; the enumerated properties of gold are all paſſive. We know by the moſt complete of all evidence, that the exerciſe of power *may be* ſuſpended, and the power itſelf remain unimpaired; but to talk of the ſuſpenſion of the energies of what was never energetic, if it be not to contradict the axiom *impoſſibile eſt idem eſſe et non eſſe*, is certainly to employ words which have no meaning. Yet even this argument from the properties of gold might have led the author to ſuſpect that ſomething elſe may be meant by the ſuſpenſion of the exerciſe of powers, than that *thoſe powers are made not to exiſt for the time* In a room perfectly dark gold is not yellow; but does it loſe any of its eſſential properties, and become a different ſubſtance, merely by being carried from light to darkneſs? Is a man while in a dark room deprived of the faculty of ſight, and one of the powers of his mind made not to exiſt for the time? The author will not affirm that either of theſe events takes place. He will tell us that gold exhibits not its yellow appearance, merely becauſe the proper medium of light paſſes not from it to the eye of the percipient, and that it is only for want of the ſame medium that nothing is ſeen by us in perfect darkneſs. Here, then, by his own confeſſion, is a power of the mind, and a property of an external object, both ſuſpended in their energies, without being annihilated: and no proof has yet been brought that all the powers of the mind may not in the ſame manner be ſuſpended in their energies without being made not to exiſt. As light is neceſſary to viſion, but is not itſelf either the thing which ſees or the thing which is ſeen; ſo may the brain be neceſſary to the phenomena of thinking, without being either that which thinks, or that which is thought upon: and as actual viſion ceaſes when light is withdrawn, though the eye and the object both continue to exiſt; ſo may the *energy* of thinking ceaſe when the brain is rendered unfit for its uſual office, though the being which thinks, and the power of thought, continue to exiſt, and to exiſt unimpaired. That this is actually the caſe every man muſt be convinced who believes that in thinking he exerts the ſame powers to-day that he exerted yeſterday; and therefore our author's ſecond demonſtration of the non-exiſtence of mind is like his firſt, founded upon aſſertions which cannot be granted.

244 A third attempt of the ſame kind

Another of theſe pretended demonſtrations is as follows: "If the ſoul exiſt at all, it muſt exiſt ſomewhere; for it is impoſſible to frame to one's ſelf an idea of any thing exiſting, which exiſts no where. But if the ſoul exiſt ſomewhere, by the terms it occupies ſpace, and therefore is extended; but whatever has extenſion, has figure in conſequence thereof. The ſoul then, if it exiſt, hath the properties of extenſion and figure in common with matter. Moreover, by the ſuppoſition of every immaterial hypotheſis (except thoſe of Malbranche, Berkeley, and Leibnitz), it acts upon body, *i. e.* upon matter; that is, it attracts and repels, and is attracted and repelled, for there is no conceivable affection of matter but what is founded on its properties of attraction and repulſion; and if it be attracted and repelled, its re-action muſt be attraction and repulſion. The ſoul then has the properties of extenſion, figure, attraction, and repulſion, or ſolidity. But theſe compriſe every property which matter, as ſuch, has ever been ſuppoſed to poſſeſs. Therefore the ſoul is matter, or material. But by the ſuppoſition it is immaterial; therefore it does not exiſt. For nothing can exiſt whoſe exiſtence implies a contradiction."

245 ſhown to confute itſelf.

Mr Cooper, we ſee, ſtill proceeds in the direct road of mathematical demonſtration; but in the preſent inſtance we beg leave to ſtop him in the very beginning of his courſe, and to aſk *where* the univerſe exiſts? When he ſhall have given ſuch an anſwer to this queſtion as men of common ſenſe may be able to comprehend, we may perhaps attempt to tell him where an unextended ſoul exiſts. If this demonſtration be not a collection of words without meaning, the exiſtence of ſpace as a real thing is taken for granted. Space, therefore, has extenſion, and of courſe figure; but we believe Mr Cooper will find ſome difficulty in aſcertaining the figure of infinite ſpace. The mind certainly acts upon body. For this we have the evidence of conſciouſneſs and experience; but we have no evidence whatever that it muſt therefore attract and repel, and be attracted and repelled. It has been already obſerved, that the mind, whatever be its ſubſtance, acts upon the body by energies of will. What theſe are every man knows with the utmoſt certainty and preciſion, whilſt we may venture to aſſert that no man knows preciſely what corpuſcular attraction and repulſion are, ſuppoſing the exiſtence of ſuch powers to be poſſible. When we ſpeak of attraction and repulſion, we have ſome obſcure notion of bodies acting upon each other at a diſtance; and this is all that we know of the matter. But when we think of an energy of the human will, the idea of diſtance neither enters nor can enter into our notion of ſuch an energy. Theſe are facts which we pretend not to prove by a mathematical or a chemical proceſs. Every man muſt be convinced of their truth by evidence more complete than any proof, *viz.* immediate conſciouſneſs of his own thoughts and volitions. This being the caſe, we may turn Mr Cooper's artillery againſt himſelf, and, becauſe mind acts upon body by powers different from attraction and repulſion, argue that body neither attracts nor repels; and were it true, as it is certainly falſe, that nothing could act upon another but by means of ſome property common to both, we might infer that every atom of matter is endowed with the powers of volition and intelligence, and by conſequence that every man is not one but ten thouſand conſcious beings, a concluſion which our philoſopher ſeems not inclined to admit.

246 Objections to the doctrine of immaterialiſm ſtated and anſwered.

Having finiſhed his *demonſtrations*, the author ſtates other objections to the doctrine of immaterialiſm, which as they are not his own nor new, have greater weight. "It appears no more than reaſonable (ſays he), that if the doctrine of materialiſm be rejected as inadequate to explain the phenomena, theſe latter ſhould at leaſt be explained in ſome manner or other better upon the *ſubſtituted* than the *rejected* hypotheſis; ſo that it is reaſonable to require of an immaterialiſt that his ſuppoſition of a diſtinct ſoul ſhould explain the *rationale* of the phenomena of thinking. But, ſtrange to ſay, ſo far from attempting to explain theſe phenomena on the immaterial hypotheſis, it is acknowledged on all hands that even on this hypotheſis the phenomena are inexplicable." This objection it would certainly be no difficult taſk to obviate; but from that trouble, ſmall as it is, we are happily exempted by the objector. "I would have it underſtood (ſays he), that no materialiſt ever undertook to ſay *how* perception reſults from our organization. What a materialiſt undertakes to aſſert is, that perception, *whatever* it be, or *however* it reſults from, does actually reſult from our organization." According to Mr Cooper, then, the *rationale* of thinking is equally inexplicable by materialiſts and immaterialiſts; and the truth is, that we know the *rationale* of hardly any one operation in nature. We ſee that the ſtroke of a racket produces motion in a biliard ball; but how it does ſo, we believe no man can ſay. Of the fact, however, we are certain; and know that the motion is produced by ſome power, about the effects of which we can reaſon with preciſion. In like manner we know with the utmoſt certainty, that we ourſelves have the powers of perception and volition; and that theſe powers cannot be conceived as either an ell or an inch long. How they reſult from the mutual agency of an immaterial and material ſubſtance upon each other, we are indeed profoundly ignorant; but that ſuch is the fact, and that they are not the reſult of mere organization, we muſt neceſſarily believe, ſo long as it is true that the power of the entire ſyſtem is nothing more than the ſum or aggregate of the powers of all its parts. The immaterial hypotheſis contains in it ſomething inexplicable by man: The material hypotheſis likewiſe contains, by the confeſſion of its advocates, ſomething that is equally inexplicable; and is over and above burdened with this contradiction, that the whole is ſomething different from all its parts. It is therefore *no* "ſingular phenomenon in literary hiſtory, that one hypotheſis ſhould be rejected as indequate to account for appearances, and that the hypotheſis ſubſtituted ſhould, even by the acknowledgement of its abettors, be ſuch as not only not to explain the *rationale* of the appearances, but, from the nature of it, to preclude all hopes of ſuch an explanation." This is exactly the caſe with reſpect to a *vacuum* in aſtronomy. That hypotheſis does not in the leaſt tend to explain the rationale of the motions of the planets; but yet it muſt be admitted in preference to a *plenum*, becauſe upon this laſt hypotheſis motion is impoſſible.

247
Whether as many things may be aſſerted of the ſoul as of the body.

"Suppoſing the exiſtence of the ſoul, it is an unfortunate circumſtance (ſays Mr Cooper), that we cannot properly aſſert poſitively any thing of it at all." Were this the caſe, it would indeed be a very unfortunate circumſtance; but can we not aſſert poſitively as many things of the ſoul as we can of the body? Can we not ſay with as much propriety and certainty, that the ſoul has the powers of perception and volition, &c. as that the body is ſolid and extended, or as that matter has the powers of attraction and repulſion? We know perfectly what perception and volition are, though we cannot have *ideas* or mental images of them; and if our author knows what attraction and repulſion are, we believe he will not pretend to have of them ideas entirely abſtracted from their objects. "But granting the ſoul's exiſtence, it may be aſked (ſays he), Of what uſe is an hypotheſis of which no more can be aſſerted than its exiſtence?" We have juſt obſerved, that much more can be aſſerted of the ſoul than its exiſtence, viz. that it is ſomething of which perception and will are properties; and he himſelf aſſerts nothing of matter but that it is ſomething of which attraction and repulſion are properties.

"This ſoul, of which theſe gentlemen (the immaterialiſts) are conſcious, is immaterial eſſentially. Now, I deny (ſays our author), that we can have any idea at all of a ſubſtance purely immaterial." He elſewhere ſays, that nothing can exiſt which is not extended, or that extenſion is inſeparable from our notions of exiſtence. Taking the word *idea* in its proper ſenſe, to denote that appearance which external objects make in the imagination, it is certainly true that we can have no *idea* of an immaterial ſubſtance; but neither have we, in that ſenſe, any idea of matter abſtracted from its qualities. Has Mr Cooper any *idea* of that which attracts and repels, or of attraction and repulſion, abſtracted from their objects? He may, perhaps, have, though we have not, very adequate ideas of bodies acting upon each other at a diſtance; but as he takes the liberty to ſubſtitute aſſertions for arguments, we beg leave in our turn to aſſert, that thoſe ideas neither are, nor can be, more clear and adequate than our notion of perception, conſciouſneſs, and will, united in one being.

That extenſion is no otherwiſe inſeparable from our notions of exiſtence than by the power of an early and perpetual aſſociation, is evident from this circumſtance, that, had we never poſſeſſed the ſenſes of ſight and touch, we never could have acquired any idea at all of extenſion. No man, who has thought on the ſubject, will venture to affirm, that it is abſolutely impoſſible for an intelligent being to exiſt with no other ſenſes than thoſe of ſmell, taſte, and hearing. Now it is obvious that ſuch a being muſt acquire ſome notion of exiſtence from his own conſciouſneſs: but into that notion extenſion could not poſſibly enter; for neither ſounds, taſtes, ſmells, nor conſciouſneſs, are extended; and it is a fundamental article of the materialiſts creed, that all our ideas are relicts of ſenſation. Since then exiſtence may be conceived without extenſion, it may be inferred that they are not inſeparable from each other; and ſince cogitation cannot be conceived with extenſion, we may reaſonably conclude that the being which thinks is not extended.

248
Extenſion not inſeparable from all notions of exiſtence.

Mr Cooper indeed with his maſter talks of extended ideas and extended thoughts: but we muſt aſſert, in the words of Cudworth, that "we cannot conceive a *thought* to be of ſuch a certain *length*, *breadth*, and *thickneſs*, meaſurable by *inches*, *feet*, and *yards*; that we cannot conceive the *half*, or *third*, or *twentieth* part of a thought; and that we cannot conceive every thought to be of ſome determinate *figure*, ſuch as *round* or *angular*, *ſpherical*, *cubical*, *cylindrical*, or the like. Whereas if extenſion were inſeparable from exiſtence, *thoughts* muſt either be mere *non-entities*, or extended into *length*, *breadth*, and *thickneſs*; and conſequently all truths in us (being nothing but complex thoughts) muſt be long, broad, and thick, and of ſome determinate figure. The ſame muſt likewiſe be affirmed of volitions, appetites, and paſſions, and of all other things belonging to cogitative beings; ſuch as knowledge and ignorance, wiſdom and folly, virtue and vice, &c. that theſe are either all of them abſolute *non-entities*, or elſe extended into three dimenſions, and meaſurable not only by *inches* and *feet*, but alſo by ſolid meaſures, ſuch as *pints* and *quarts*. But if this be abſurd, and if theſe things belonging to ſoul and mind (though doubtleſs as great realities at leaſt as the things which belong to body) be *unextended*, then muſt the ſubſtances of ſouls or minds be themſelves unextended, according to that of Plotinus, Νους ου διαστας αφ εαυτου, and therefore the human ſoul cannot be material."

249
That the human mind cannot exert its faculties but in union with ſome corporeal ſyſtem, an opinion probable and

Mr Cooper employs many other arguments to prove the materiality of the ſentient principle in man; but the force of them extends no farther than to make it in the higheſt degree probable, that the mind cannot exert its faculties but in union with ſome organiſed corporeal ſyſtem. This is an opinion which we feel not ourſelves inclined to controvert; and therefore we ſhall not make any particular remarks upon that part of our author's reaſonings. That an immaterial and indiſcerptible being, ſuch as the ſoul, is not liable to be *diſſolved* with the body, is a fact which cannot be controverted: for what has no parts can periſh only by *annihilation*; and of annihilation the annals of the world afford no inſtance. That an immaterial being, endowed with the powers of perception and volition, &c. *may be capable* of exerting theſe powers in a ſtate of ſeparation from all body? and that at leaſt one immaterial Being does actually ſo exert them, or other powers analogous to them, are truths which no man whoſe arrogance does not ſurpaſs his judgment will venture to deny; but the queſtion at preſent between the moſt rigid immaterialiſts and their opponents, is, whether there is ground to think that the human ſoul is ſuch a being?

Now, when Mr Baxter and his fellowers confidently affirm, that human perception muſt *neceſſarily* ſubſiſt after the diſſolution of the preſent mortal and periſhable ſyſtem; and that the ſoul, when diſencumbered of *all body*, will have its faculties greatly *enlarged;* they affirm what to us appears incapable of proof. That a diſembodied ſoul *may* perceive and think, and act, and that its powers of intellection *may* have a wider range than when they were circumſcribed by a corporeal ſyſtem, which permitted their action upon external objects only through five organs of ſenſe, is certainly *poſſible;* and the argument by which the materialiſts pretend to prove it *not* poſſible, is one of the moſt contemptible ſophiſms that ever diſgraced the page of philoſophy. To affirm, that becauſe our intellectual powers, in their embodied ſtate, ſeem to decay with the ſyſtem to which they are united, the mind, when ſet free, muſt therefore have no ſuch powers at all, is equally abſurd as to ſay, that becauſe a man ſhut up in a room which has but one window ſees objects leſs and leſs diſtinctly as the glaſs becomes more and more dimmed, he muſt in the open air be deprived of the power of viſion. But becauſe the human ſoul *may*, for any thing that we ſee to the contrary, ſubſiſt, and think, and act, in a ſeparate ſtate, it does not therefore neceſſarily follow that it *will* do ſo; and every thing that we know of its nature and its energies leads us to think, that without ſome kind of body by which to act as by an inſtrument, all its powers would continue dormant. There is not the ſhadow of a reaſon to ſuppoſe that it exiſted and was conſcious in a prior ſtate; and as its memory at preſent unqueſtionably depends upon the ſtate of the brain, there is all the evidence of which the caſe will admit, that if it ſhould ſubſiſt in a future ſtate diveſted of all body, though it might be endowed with new and enlarged powers of *perception*, it could have no *recollection* of what it did and ſuffered in *this world*, and therefore would not be a fit object either of reward or of puniſhment. This conſideration has compelled many thinking men, both Pagans and Chriſtians, to ſuppoſe that at death the ſoul carries with it a fine material vehicle, which is its immediate ſenſorium in this world, and continues to be the ſeat of its recollection in the next. Such, we have ſeen, was the opinion of Mr Wollaſton and Dr Hartley; it was likewiſe the opinion of Cudworth and Locke, who held that the ſupreme Being alone is the only mind wholly ſeparated from matter; and it is an opinion which even Dr Clarke, one of the ableſt advocates for immaterialiſm, would not venture poſitively to deny.

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Ancient.

Nor is this opinion peculiar to a few moderns. Cudworth, after giving a vaſt number of quotations from Pythagoreans and Platoniſts, which prove to a demonſtration that they held the Deity to be the only mind which perceives and acts without the inſtrumentality of matter, obſerves, that "from what hath been ſaid, it appeareth, that the moſt ancient aſſertors of the incorporeity and immortality of the human ſoul, yet ſuppoſed it to be always conjoined with ſome body. Thus *Hierocles* plainly ἡ λογικη ουσια συμφυες εχουσα σωμα ουτω παρα του δημιουργου εις το ειναι παρηλθεν, ως μητε το σωμα ειναι αυτην, μητε ανευ σωματος· αλλ αυτην μεν ασωματον, αποτελεισθαι δε εις σωμα το ολον αυτης ειδος. *The rational nature having always a kindred body, ſo proceeded from the demiurgus, as that neither itſelf is body, nor yet can it be without body; but though itſelf be incorporeal, yet its whole form is terminated in a body.* Agreeably to this the definition which he gives of a man is, ψυχη λογικη μετα συμφυους αθανατου σωματος, *a rational ſoul, together with a kindred immortal body;* and he affirms, that our preſent animated terreſtrial body, or mortal man, is nothing but ειδωλον ανθρωπου, *the image of the true man*, or an acceſſion from which it may be ſeparated. Neither does he affirm this only of human ſouls, but alſo of all other rational beings whatſoever below the ſupreme Deity, that they always naturally actuate ſome body. Wherefore a demon or angel (which by *Hierocles* are uſed as ſynonymous words), is alſo defined by him after the ſame manner, ψυχη λογικη μετα φωτεινου σωματος *a rational ſoul, together with a lucid body.* And accordingly *Proclus* upon *Plato's Timæus affirmeth*, παντα δαιμονα των ημετερων κρειττονα ψυχων, και νοεραν εχειν ψυχην, και ὀχημα αιθεριον: *That every demon, ſuperior to human ſouls, hath both an intellectual ſoul and an ætherial vehicle, the entireneſs thereof being made up or compounded of theſe two things.* So that there is hardly any other difference left between demons or angels, and men according to theſe philoſophers, but only this, that the former are lapſable into aerial bodies only, and no further; but the latter into terreſtrial alſo. Now, *Hierocles* poſitively affirms this to have been the true cabala, and genuine doctrine of the ancient Pythagoreans, entertained afterwards by Plato: και τουτο των Πυθαγορειων ἠν δογμα, ὁ δε Πλατων υστερον εξεφηνεν, απεικασας ξυμφυτω δυναμει υποπτερου ζευγους τε και ἡνιοχου; πασαν θειαν τε και ανθρωπινην ψυχην. *And this was the doctrine of the Pythagoreans, which Plato afterwards declared; he reſembling every both human and divine ſoul* (i. e. in our modern language, every created rational being) *to a winged chariot, and a driver or charioteer both together:* meaning by the chariot, an animated body; and by the charioteer, the incorporeal ſoul actuating it.

That this Pythagorean opinion of the Deity's being the only mind which thinks and acts without material organs was very generally received by the ancient Chriſtians, might be proved by a thouſand quotations: We ſhall content ourſelves with producing two from the learned *Origen*. "Solius Dei (ſaith this philoſophic father of the Church), id eſt, Patris, Filii, et Spiritus Sancti, naturæ id proprium eſt, ut ſine materiali ſubſtantia, et abſque ulla corporeæ adjectionis ſocietate, intelligatur ſubſiſtere †." "Materialem ſubſtantiam opinione quidem et intellectu ſolum ſeparari, a naturis rationalibus, et pro ipſis, vel poſt ipſis affectam videri; ſed nunquam ſine ipſa eas vel vixiſſe, vel vivere: Solius namque Trinitatis incorporea vita exiſtere putabitur ‡." Should Mr Cooper and his friends aſk, What is the uſe of a ſoul which cannot act without the inſtrumentality of matter? or why we ſhould ſuppoſe the exiſtence of ſuch a ſubſtance? we beg leave, in our turn, to aſk theſe gentlemen, What is the uſe of a brain which cannot ſee without eyes? and

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† Peri Archon, lib. 1. cap. 6.

‡ Lib. 2. cap. 2.

Of Perſonal Identity.

and why they ſhould ſuppoſe all our ſenſations to terminate in ſuch an internal ſyſtem, ſince the vulgar certainly ſuppoſe their ſenſations to ſubſiſt in their reſpective organs? How this ancient notion, which makes body ſo eſſential a part of man, is conſiſtent with the immortality of the human ſoul, we ſhall inquire in a ſubſequent chapter; in which we ſhall endeavour to aſcertain what kind of immortality we have reaſon to expect, and upon what evidence our expectation muſt reſt. Previous to this inquiry, however, it is neceſſary to enter upon another, which is of the firſt importance, and which every materialiſt has endeavoured to perplex; we mean that which concerns *perſonal identity*: for if, as has been often ſaid, no man is the ſame perſon two days ſucceſſively, it is of no importance to us whether the ſoul be mortal or immortal.

CHAP. III. *Of* PERSONAL IDENTITY.

251 Perſonal identity,

WHETHER we are to live in a future ſtate, as it is the moſt important queſtion which can poſſibly be aſked, ſo is it the moſt intelligible one which can be expreſſed in language. Yet ſtrange perplexities have been raiſed about the meaning of that identity or ſameneſs of perſon, which is implied in the notion of our living now and hereafter, or indeed in any two ſucceſſive moments; and the ſolution of theſe difficulties hath been ſtranger than the difficulties themſelves. To repeat all that has been ſaid on the ſubject would ſwell this chapter to a diſproportionate bulk. We ſhall therefore content ourſelves with laying before our readers the ſentiments of Biſhop Butler, and the fancies and demonſtrations of the philoſopher of Mancheſter. We are induced to adopt this courſe, becauſe we think the illuſtrious Biſhop of Durham has exhauſted the ſubject, by ſtating fairly the opinions which he controverts, and by eſtabliſhing his own upon a foundation which cannot be ſhaken, and which are certainly not injured, by the objections of Mr Cooper.

252 though it cannot be defined, eaſily underſtood and aſcertained by conſciouſneſs and memory.

"When it is aſked (ſays this philoſophical prelate†) in what perſonal identity conſiſts? the anſwer ſhould be the ſame as if it were aſked in what conſiſts ſimilitude or equality?—that all attempts to define would but perplex it. Yet there is no difficulty at all in aſcertaining the idea or notion: For as, upon two triangles being compared or viewed together, there ariſes to the mind the notion of ſimilitude; or, upon twice two and four, the notion of equality: ſo likewiſe, upon comparing the conſciouſneſs of one's ſelf or one's own exiſtence in any two moments, there as immediately ariſes to the mind the notion of perſonal identity. And as the two former compariſons not only give us the notions of ſimilitude and equality, but alſo ſhow us that two triangles are ſimilar, and that twice two and four are equal; ſo the latter compariſon not only gives us the notion of perſonal identity, but alſo ſhows us the identity of ourſelves in theſe two moments—the preſent, ſuppoſe, and that immediately paſt, or the preſent and that a month, a year, or twenty years paſt. In other words, by reflecting upon that which is myſelf now, and that which was myſelf twenty years ago, I diſcern they are not two, but one and the ſame ſelf.

"But though conſciouſneſs of what is preſent and remembrance of what is paſt do thus aſcertain our perſonal identity to ourſelves; yet, to ſay that remembrance makes perſonal identity, or is neceſſary to our being the ſame perſons, is to ſay that a perſon has not exiſted a ſingle moment, nor done one action, but what he can remember; indeed none but what he reflects upon. And one ſhould really think it ſelf-evident, that conſciouſneſs of perſonal identity preſuppoſes and therefore cannot conſtitute perſonal identity; any more than knowledge, in any other caſe, can conſtitute truth, which it preſuppoſes.

253 This, however, does not make perſonal identity.

"The inquiry, what makes vegetables the ſame in the common acceptation of the word, does not appear to have any relation to this of perſonal identity; becauſe the word *ſame*, when applied to them and to perſon, is not only applied to different ſubjects, but is alſo uſed in different ſenſes. When a man ſwears to the ſame tree, as having ſtood fifty years in the ſame place, he means only the ſame as to all the purpoſes of property and uſes of common life, and not that the tree has been all that time the ſame in the ſtrict philoſophical ſenſe of the word: For he does not know whether any one particle of the preſent tree be the ſame with any one particle of the tree which ſtood in the ſame place fifty years ago. And if they have not one common particle of matter, they cannot be the ſame tree in the proper and philoſophic ſenſe of the word *ſame*; it being evidently a contradiction in terms to ſay they are, when no part of their ſubſtance and no one of their properties is the ſame; no part of their ſubſtance, by the ſuppoſition; no one of their properties, becauſe it is allowed that the ſame property cannot be transferred from one ſubſtance to another: And therefore, when we ſay that the identity of ſameneſs of a plant conſiſts in a continuation of the ſame life, communicated under the ſame organization to a number of particles of matter, whether the ſame or not; the word *ſame*, when applied to life and to organiſation, cannot poſſibly be underſtood to ſignify what it ſignifies in this very ſentence, when applied to matter. In a looſe and popular ſenſe, then, the life, and the organiſation, and the plant, are juſtly ſaid to be the ſame, notwithſtanding the perpetual change of the parts. But, in a ſtrict and philoſophical manner of ſpeech, no man, no being, no mode of being, no any thing, can be the ſame with that with which it has indeed nothing the ſame. Now ſameneſs is uſed in this latter ſenſe when applied to perſons. The identity of theſe, therefore, cannot ſubſiſt with diverſity of ſubſtance.

254 What it is.

"The thing here conſidered, and demonſtratively, as I think, determined, is propoſed by Mr Locke in theſe words: *Whether it* (i. e. the ſame ſelf or perſon) *be the ſame identical ſubſtance?* And he has ſuggeſted what is a much better anſwer to the queſtion than that which he gives it in form: For he defines perſon *a thinking intelligent being*, &c. and perſonal identity, *the ſameneſs of a rational being*; and then the queſtion is, Whether the ſame rational being is the ſame ſubſtance? which needs no anſwer; becauſe being and ſubſtance are in this place ſynonymous terms. The ground of the doubt, whether the ſame perſon be the ſame ſubſtance, is ſaid to be this, that the conſciouſneſs of our own exiſtence, in youth and in old age, or in any two joint ſucceſſive moments, is not *the ſame individual action*, i. e.

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† Diſſertation 1ſt, ſubjoined to the Analogy of Religion, &c.

i. e. not the ſame conſciouſneſs, but different ſucceſſive conſciouſneſſes. Now it is ſtrange that this ſhould have occaſioned ſuch perplexities: for it is ſurely conceivable, that a perſon may have a capacity of knowing ſome object or other to be the ſame now which it was when he contemplated it formerly; yet in this caſe, where, by the ſuppoſition, the object is perceived to be the ſame, the perception of it in any two moments cannot be one and the ſame perception. And thus, though the ſucceſſive conſciouſneſſes which we have of our own exiſtence are not the ſame, yet are they conſciouſneſſes of one and the ſame thing or object; of the ſame perſon, ſelf, or living agent. The perſon of whoſe exiſtence the conſciouſneſs is felt now, and was felt an hour or a year ago, is diſcerned to be, not two perſons, but one and the ſame perſon; and therefore is one and the ſame.

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Falſe notions of perſonal identity

"Mr Locke's obſervations upon this ſubject appear haſty; and he ſeems to profeſs himſelf diſſatisfied with ſuppoſitions which he has made relating to it. But ſome of thoſe haſty obſervations have been carried to a ſtrange length by others; whoſe notion, when traced and examined to the bottom, amounts, I think, to this: "That perſonality is not a permanent but a tranſient thing: That it lives and dies, begins and ends, continually: That no one can any more remain one and the ſame perſon two moments together, than two ſucceſſive moments can be one and the ſame moment: That our ſubſtance is indeed continually changing: but whether this be ſo or not is, it ſeems, nothing to the purpoſe; ſince it is not ſubſtance, but conſciouſneſs, alone, which conſtitutes perſonality; which conſciouſneſs, being ſucceſſive, cannot be the ſame in any two moments, nor conſequently the perſonality conſtituted by it §." Hence it muſt follow, that it is a fallacy upon ourſelves to charge our preſent ſelves with any thing we did, or to imagine our preſent ſelves intereſted in any thing which befel us, yeſterday; or that our preſent ſelf will be intereſted in what will befal us to-morrow; ſince our preſent ſelf is not in reality the ſame with the ſelf of yeſterday, but another ſelf or perſon coming in its room, and miſtaken for it; to which another ſelf will ſucceed to-morrow. This, I ſay, muſt follow: for if the ſelf or perſon of to-day and that of to-morrow are not the ſame, but only like perſons; the perſon of to-day is really no more intereſted in what will befal the perſon of to-morrow, than in what will befal any other perſon. It may be thought, perhaps, that this is not a juſt repreſentation of the opinion we are ſpeaking of; becauſe thoſe who maintain it allow that a perſon is the ſame as far back as his remembrance reaches: And indeed they do uſe the words *identity* and *ſame* perſon; nor will language permit theſe words to be laid aſide. But they cannot, conſiſtently with themſelves, mean that the perſon is really the ſame: for it is ſelf-evident, that the perſonality cannot be really the ſame, if, as they expreſsly aſſert, that in which it conſiſts is not the ſame. And as, conſiſtently with themſelves, they cannot, ſo I think it appears they do not, mean that the perſon is *really* the ſame, but only that he is ſo in a fictitious ſenſe, in ſuch a ſenſe only as they aſſert: for this they do aſſert, that any number of perſons whatever may be the ſame perſon. The bare unfolding this notion, and laying it thus naked and open, ſeems the beſt confutation of it. However, ſince great ſtreſs is ſaid to be put upon it, I add the followings things:

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Overthrown.

"*Firſt*, The notion is abſolutely contradictory to that certain conviction, which neceſſarily and every moment riſes within us, when we turn our thoughts upon ourſelves, when we reflect upon what is paſt, and look forward to what is to come. All imagination, of a daily change of that living agent which each man calls himſelf for another, or of any ſuch change throughout our whole preſent life, is entirely borne down by our natural ſenſe of things. Nor is it poſſible for a perſon in his wits to alter his conduct with regard to his health or affairs, from a ſuſpicion that though he ſhould live to-morrow he ſhould not however be the ſame perſon he is to day.

"*Secondly*, It is not an *idea*, or abſtract *notion*, or quality, but a being only which is capable of life and action, of happineſs and miſery. Now all beings confeſſedly continue the ſame during the whole time of their exiſtence. Conſider then a living being now exiſting, and which has exiſted for any time alive: this living being muſt have done, and ſuffered, and enjoyed, what it has done, and ſuffered, and enjoyed, formerly (this living being, I ſay, and not another), as really as it does, and ſuffers, and enjoys, what it does, and ſuffers, and enjoys, this inſtant. All theſe ſucceſſive actions, ſufferings, and enjoyments, are actions, enjoyments, and ſufferings, of the ſame living being; and they are ſo prior to all conſiderations of its remembering or forgetting, ſince remembering or forgetting can make no alteration in the truth of paſt matter of fact. And ſuppoſe this being endued with limited powers of knowledge and memory, there is no more difficulty in conceiving it to have a power of knowing itſelf to be the ſame being which it was ſome time ago, of remembering ſome of its actions, ſufferings, and enjoyments, and forgetting others, than in conceiving it to know, or remember, or forget, any thing elſe.

"*Thirdly*, Every perſon is conſcious that he is now the ſame perſon or ſelf he was as far back as his remembrance reaches: ſince when any one reflects upon a paſt action of his own, he is juſt as certain of the perſon who did that action, namely himſelf (the perſon who now reflects upon it), as he is certain that the action was at all done. Nay, very often a perſon's aſſurance of an action having been done, of which he is abſolutely aſſured, ariſes wholly from the conſciouſneſs that he himſelf did it: and this he, perſon, or ſelf, muſt either be a ſubſtance or the property of ſome ſubſtance. If *he*, if perſon, be a ſubſtance; then conſciouſneſs that he is the ſame perſon, is conſciouſneſs that he is the ſame ſubſtance. If the perſon, or *he*, be the property of a ſubſtance, ſtill conſciouſneſs that he is the ſame property is as certain a proof that his ſubſtance remains the ſame, as conſciouſneſs that he remains the ſame ſubſtance would be; ſince the ſame property cannot be transferred from one ſubſtance to another.

"But though we are thus certain that we are the ſame agents, living beings, or ſubſtances, now, which we were as far back as our remembrance reaches; yet it is aſked, Whether we may not poſſibly be deceived in it? And this queſtion may be aſked at the end of any demonſtration whatever; becauſe it is a queſtion concerning the truth of perception by memory: and he who can doubt whether perception by memory can in this caſe be depended upon, may doubt alſo whether perception by deduction and reaſoning, which alſo include memory, or indeed whether intuitive perception itſelf, can be depended upon. Here then we can go no farther: for it is ridiculous to attempt to prove the truth of our faculties, which can no otherwiſe be proved than by the uſe or means of thoſe ſuſpected faculties themſelves."

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§ Anſwer to Dr Clarke's third Defence of his Letter to Mr Dodwell, ſecond edit. p. 44, 56, &c.

257 Objections to the foregoing reaſoning.

This reaſoning, which we believe will to moſt men appear unanſwerable, Mr Cooper hopes to overturn by the following obſervations *: "If all imagination of a daily change in us be borne down by our natural ſenſe of things, then (ſays he) does our natural ſenſe of things poſitively contradict known fact; for a daily, a momentaneous change in us, *i. e.* in our bodies, does actually take place." True, a daily change in our bodies does take place, and ſo likewiſe does a daily change in our cloaths; but ſurely no man was ever led by his natural ſenſe of things to ſuppoſe, that his limbs or external organs were the ſeats of ſenſation and will, any more than that his coat or his ſhoes were any real parts of his trunk or of his feet. But it is only that which thinks and wills that any man conſiders, in this caſe, as himſelf or his perſon; and if our natural ſenſe of things, or conſciouſneſs, tells us, that what thinks and wills has continued the ſame from a diſtance of time as far back as we can remember, it is certain, that, whether it be material or immaterial, it has continued from that period, otherwiſe we can be certain of nothing. "But (ſays our philoſopher) other known and aſcertained facts are frequently borne down by our natural ſenſe of things: for how many thouſand years before the days of *Copernicus* was the motion of the earth round the *ſun* entirely borne down by our natural ſenſe of things which made us give full credit to the motion of the ſun round the earth? Do not the generality of mankind believe, upon the evidence of their natural ſenſe of things, that every part of their body remains exactly the ſame today as it was yeſterday?"

* Tracts, &c.

258 Anſwered.

To the former of theſe queſtions we anſwer poſitively, that before the days of *Copernicus* the motion of the earth round the ſun was *not* borne down by our *natural ſenſe* of things, but by ill-founded hypotheſes and inconcluſive reaſonings. By the natural ſenſe of things, nothing can be meant, in this place, but the evidence of conſciouſneſs or of external ſenſation; but the *actual motion* either of the ſun or of the earth is not perceived either by conſciouſneſs or by ſenſation. Of conſciouſneſs nothing is the object but the internal energies and feelings of our own minds; and with regard to the motion of the ſun or of the earth, nothing is perceived by the ſenſe of ſight but that, after conſiderable intervals of time, theſe two great bodies have repeatedly changed their places in the heavens with reſpect to each other. This is all that on this ſubject our *natural ſenſe of things* leads us to believe; and is not this infallibly true? Afterwards indeed, by taking for granted the truth of propoſitions, for which neither ſenſe nor conſciouſneſs affords the ſhadow of evidence; the vulgar now, and all mankind formerly, reaſoned themſelves into the opinion, that the earth ſtands ſtill, and that the ſun moves round it. In vulgar philoſophy it is taken for granted, that in the univerſe there is not a *relative* but an *abſolute upwards* and an *abſolute downwards*; that our heads are abſolutely upward, and our feet downward; and that were the earth to revolve round its axis, theſe poſitions would be reverſed, that our heads would be placed beneath our feet, and that we ourſelves would fall from the earth into empty ſpace. Upon theſe falſe hypotheſes the vulgar reaſon correctly. They know that bodies cannot change their place without motion; they know that in the time of their remembrance the ſun and the earth have been perpetually varying their places with reſpect to each other; they know that they themſelves have never fallen, nor had a tendency to fall, into empty ſpace; and hence they infer that it is the ſun and not the earth that moves (K). But will any man ſay that the abſurd ſuppoſitions from which this concluſion is logically deduced, have the evidence either of ſenſation or conſciouſneſs, as the permanency of that living agent which each man calls himſelf has?

To our author's ſecond queſtion we likewiſe reply with confidence, that the generality of mankind do *not* believe, upon their natural ſenſe of things, that every part of their body remains exactly the ſame to-day as it was yeſterday. It would be ſtrange indeed if they did, after having repeatedly experienced the waſte of increaſed perſpiration or ſweating; after having witneſſed men emaciated by ſickneſs, and again reſtored to plumpneſs in health; and after having perhaps loſt whole limbs, which certainly their natural ſenſe of things teaches them to conſider as parts of their body. In all theſe caſes, the generality of mankind are as ſenſible of changes having taken place in their bodies as he who has attended ever ſo cloſely to phyſiological inquiries, though not one of them has the leaſt imagination of a change having taken place in the living agent which each man calls himſelf.

Biſhop Butler obſerves, that if the living agent be perpetually changing, it is a fallacy upon ourſelves to charge our preſent ſelves with any thing we did, to imagine our preſent ſelves intereſted in any thing which befel us yeſterday, or that our preſent ſelf will be intereſted in what will befal us to-morrow. To this judicious obſervation our daring philoſopher replies, "that as the man of to-morrow, though not in all points the ſame with, yet depends for his exiſtence upon, the man of to-day, there is ſufficient reaſon to care about him." Could he have ſaid, that as the man of to-day depends for his exiſtence on the man of to-morrow, there is ſufficient reaſon for the preſent man to care about the future man; or that as the man of to-morrow depends for his exiſtence on the man of to-day,

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(K) This inference too has been ſo often drawn, that it comes in time to coaleſce in the mind with the *ſenſations*, from which the motion either of the ſun or of the earth is deduced with infallible certainty; and hence it is conſidered as part of that truth which ſenſation immediately diſcovers. *See our Chapter of* Association.

day, there is to-day ſufficient reaſon for the future man to care about the preſent man; we ſhould in either caſe, if the anachroniſm had been kept out of ſight, have ſeen the force of his argument. Every man has ſufficient reaſon to care about the ox upon which he is to be fed; but we cannot ſo clearly perceive what reaſon the ox has to care about the man.

Not ſatisfied, it would ſeem, with this reply, our author proceeds to affirm, "that the man of to-morrow, poſſeſſing a reminiſcence of the actions of the man of to-day, and knowing that theſe actions will be referred to him both by himſelf and others, (which is certainly knowing that both himſelf and others are moſt iniquitous wretches), they cannot be indifferent to the man of to-day, who looks forward to the properties of the man of to-morrow;" *i. e.* the reminiſcence and knowledge of a future man conſtitute all the relation that ſubſiſts between the preſent man and his actions; a diſcovery worthy of an original genius. But as on the ſubject of perſonal identity we pretend to no originality, we ſhall leave this propoſition to the meditation of our readers and take the liberty to aſk our author a queſtion or two reſpecting this ſame reminiſcence, which he is graciouſly pleaſed to acknowledge for a property.

He defines identity, "the continued exiſtence of any being unaltered in ſubſtance or in properties;" and he repeatedly acknowledges that no identical quality or property can be transferred from one ſubject to another. Let us now ſuppoſe, that a man has a reminiſcence of an individual action performed a month ago, and that this reminiſcence is accompanied with a conſciouſneſs that the action was performed by himſelf. This ſuppoſition, whether true or falſe, may certainly be made; for it implies nothing more than what every man firmly believes of himſelf in every act of remembrance. Let us again ſuppoſe, that, at the diſtance of ten or twenty years, the man known by the ſame name has a reminiſcence of the ſame action, with a conſciouſneſs that he himſelf performed it. Is this reminiſcence the ſame with the former? or is it a different reminiſcence? If it be the ſame, either the perſon remembering at the diſtance of ten or twenty years is the ſame with him who remembered at the diſtance of a month, or there is an identical quality transferred from one ſubſtance to another, which is admitted to be impoſſible. If reminiſcence be itſelf a real and immediate quality of any ſubſtance, and not the mere energy of a power, and if the one reminiſcence be different from the other, the ſubjects in which theſe two different qualities inhere muſt likewiſe be different. Yet the man who has the reminiſcence at the diſtance of a month has the evidence of conſciouſneſs that the action was performed by him; and the man who has the reminiſcence at the diſtance of ten or twenty years, has likewiſe the evidence of conſciouſneſs that the ſame action was performed by him and not by another. By the confeſſion of Hume and of all philoſophers, conſciouſneſs never deceives; but here is the evidence of one conſciouſneſs in direct oppoſition to another; and therefore, as two contradictory propoſitions cannot both be true, either the one reminiſcence is the ſame with the other, or reminiſcence is no real quality. That one act of reminiſcence ſhould be numerically the ſame with another, which followed it at the diſtance of twenty years, is plainly impoſſible; whence it ſhould ſeem, that reminiſcence itſelf is no real and immediate quality of any ſubſtance. But if this be ſo, what is reminiſcence? We anſwer, it is plainly neither more nor leſs than the *energy* of a power, which though dormant between its energies, remains unchanged from the one to the other, and which being itſelf the real or immediate quality of a ſubject, that ſubject muſt likewiſe remain unchanged. That powers may remain dormant, and yet unchanged, every man muſt be convinced; who having ſtruck any thing with his hand, knows that he has power to repeat the ſtroke, and yet does not actually repeat it. Two blows with the hand immediately following each other are numerically different, ſo that the one cannot with truth be ſaid to be the other; but we have the evidence of external ſenſe, that they are both ſtruck by the ſame member. In like manner, two energies of reminiſcence directed to the ſame object, and ſucceeding each other at any interval of time, cannot poſſibly be one and the ſame energy; but as the latter energy may include in it the former as well as the object remembered by both, we have the evidence of conſciouſneſs that both are energies of the ſame power; and we have ſeen, that to ſuppoſe them any thing elſe, may be demonſtrated to involve the groſſeſt abſurdities and contradictions.

Mr Cooper has other arguments to obviate the force of Biſhop Butler's demonſtration of perſonal identity; ſuch as, that a "high degree of *ſimilarity* between the two ſucceeding men is ſufficient to make the one care about the other;" and that "a good man, knowing that a future being will be puniſhed or rewarded as the actions of the preſent man deſerve, will have a ſufficient motive to do right and to abſtain from wrong." But if there be any one of our readers who can ſuffer himſelf to be perſuaded by ſuch aſſertions as theſe, that the living agent which he calls himſelf is perpetually changing, and at the ſame time that ſuch change is conſiſtent with the expectation of future rewards and puniſhments, he would not be reclaimed from his error by any reaſoning of ours. We ſhall therefore truſt ſuch trifling with every man's judgment, and proceed to examine our author's *demonſtration*, that perſonal identity has no exiſtence. But here it is no part of our purpoſe to accompany him through his long chemical rabble, or to controvert his arguments for the non-identity of vegetable and animal bodies. The only thing to which, after Biſhop Butler, we have aſcribed identity, is that which in man is ſentient and conſcious; and the non-identity of this thing, whatever it be, Mr Cooper undertakes to demonſtrate from the known properties of ſenſations and ideas.

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A pretended demonſtration that perſonal identity is impoſſible

This demonſtration ſets out with a very ominous circumſtance. The author, after conducting impreſſions *ab extra*, from the extremities of the nerves to the brain, affirms, that *ſenſations* and *ideas* are nothing but "motions in the brain perceived;" *i. e.* when a man thinks he is looking at a mountain, not only at reſt, but to appearance immoveable, he is groſsly deceived; for he perceives nothing all the while but *motion in his brain!* Were not the deſire of advancing novelties and paradoxes invincible in ſome minds, we ſhould be aſtoniſhed at finding ſuch an aſſertion as this fall from the pen of any man who had paid the ſlighteſt attention to the different energies of his own intellect. Motions in the brain, as we have repeatedly obſerved, are the immediate cauſes of our ſenſations; but is it conceivable, is it poſſible, that any thing would be the cauſe of itſelf? The motion of a ſword through the heart of a man is the immediate cauſe of that man's death; but is the ſword or its motion *death* itſelf, or can they be conceived as being the *ſenſations* of the *man* in the *agonies* of *dying?* But ſenſations and ideas, whatever they be, exiſt in ſucceſſion; and therefore, argues our demonſtrator, no two ſenſations or ideas can be one and the ſame ſenſation or idea. The concluſion is logically inferred; but what purpoſe can it poſſibly ſerve? What purpoſe, why it ſeems "ſenſations and ideas are the only *exiſtences whoſe exiſtence* we certainly know (a charming phraſe, the *exiſtence* of *exiſtences*, and as original as the theory in which it makes its appearance); and, therefore, from the nature of ſenſations and ideas, there is no ſuch thing as permanent identity." Indeed! what then, we may be permitted to aſk, is the import of the word *we* in this ſentence? Does it denote a ſeries of ſenſations and ideas, and does each ſenſation and each idea certainly know not only itſelf, but all its anceſtors and all its deſcendants? Unleſs this be admitted, we are afraid that ſome other exiſtence beſides ſenſations and ideas muſt be allowed to be certainly known, and even to have ſomething of a permanent identity. Nay, we think it has been already demonſtrated (ſee chap. of Time), that were there not ſomething permanent, there could be no time, and of courſe no notion of a firſt and laſt, or indeed of ſucceſſion, whether of ſenſations or ideas. And therefore, if we have ſuch a notion, which the author here takes for granted, and upon which indeed his demonſtration reſts, it follows undeniably that there is ſomething permanent, and that we *know* there is ſomething permanent, which obſerves the ſuceſſion of ſenſations and ideas.

260 Shown to be abſurd and ridiculous.

All this, indeed, Mr Cooper in effect grants; for he is not much ſtartled at the appearance of contradictions in his theory. "I find (ſays he), by perpetually repeated impreſſions which I perceive, that my hands, body, limbs, &c. are connected, are parts of one whole. I find, by perpetually repeated perceptions alſo, that the ſenſations excited by them are conſtantly ſimilar, and conſtantly different from the ſenſations excited by others." He has then repeated perceptions; but how can this be poſſible, if *he* be not different from the perceptions, and if *he* do not *remain unchanged* while the perceptions ſucceed each other at greater or leſs intervals of time? A ſtriking object paſſing with rapidity before the eyes of a number of men placed beſide each other in a line of battle, would undoubtedly excite a ſucceſſion of ſenſations; but ſurely that ſucceſſion would not take place in the mind of *any individual* in the line, nor could any *ſingle man* in this caſe ſay with truth that he had *repeated* perceptions of the object. In like manner, were that which is ſentient perpetually changing, no man could poſſibly ſay or ſuppoſe that he had repeated perceptions of any thing; for upon this ſuppoſition, the man of to-day would have no more connection with the man who bore his name yeſterday, or twenty years ago, than the laſt man in the line had with the firſt.

Upon the whole, we cannot help thinking, that Biſhop Butler's demonſtration of perſonal identity remains unſhaken by the batteries of Mr Cooper.—It reſts, indeed, upon the ſolid baſis of conſciouſneſs and memory; and if implicit credit be not given to the evidence of theſe faculties, we cannot proceed a ſingle ſtep in any enquiry whatever, nor be certain of the truth even of a mathematical demonſtration.

261 A difficulty removed.

But as we have ourſelves ſuppoſed, that to ſenſation, reminiſcence, and every actual energy of the mind of man, the inſtrumentality of ſome material ſyſtem is neceſſary, it may perhaps be thought incumbent on us to ſhow how the perpetual flux of the particles of matter which compoſe the brain, as well as all the other parts of the body, can conſiſt with the identity of the perſon who perceives, remembers, and is conſcious. If this cannot be done, our hypotheſes, ancient and plauſible as it is, muſt be given up; for of perſonal identity it is impoſſible to doubt. In this caſe, however, we perceive no difficulty; for if there be united to the brain an immaterial being, which is the ſubject of ſenſation, conſciouſneſs, and will, &c. it is obvious, that all the *intellectual powers* which properly conſtitute the perſon, muſt be inherent in that being. The material ſyſtem, therefore, can be neceſſary only as an inſtrument to excite the energies of thoſe powers; and ſince the powers themſelves remain unchanged, why ſhould we ſuppoſe that their energies may not continually be exerted by ſucceſſive inſtruments of the ſame kind, as well as by one permanent inſtrument? The powers of perception and volition are not in the material ſyſtem, any more than the ſenſation of ſeeing is in the rays of light, or the energy of the blackſmith in the hammer with which he beats the anvil. Let us ſuppoſe a man to keep his eye for an hour ſteadily fixed upon one object. It will not ſurely be denied, that if this could be done, he would have one uninterrupted and unvaried perception of an hour's duration, as meaſured by the clock. Yet it is certain, that the rays of light which alone could occaſion that perception would be perpetually changing. In like manner, a blackſmith, whilſt he continues to beat his anvil, continues to exert the ſame power whether he uſes one hammer all the time, or a different hammer at each ſtroke. The reaſon is obvious; the eye, with all its connections of brain and mind in the one caſe, and the perſon of the ſmith in the other, remain unchanged; and in them alone reſide the faculty of ſenſation and the power of beating, though neither the faculty nor the power can be exerted without material inſtruments. But were it poſſible that millions of men could in the ſpace of an hour take their turns in rotation with each new ray of light, it is ſelf-evident, that in this caſe, there would be nothing permanent in ſenſation; and, therefore, there could not be one uninterrupted and unvaried perception, but millions of perceptions, during the hour, totally diſtinct from and unconnected with each other. Let us now ſuppoſe a man to fix his eye upon an object for the ſpace of a minute, and at the diſtance of a day or a month to fix it upon the ſame object a ſecond time. He would not indeed, in this caſe, have one uninterrupted and unvaried perception, but he would be conſcious of the energy of the very ſame faculty the ſecond time as at the firſt. Whereas, were one man to view an object to-day, and another to view the ſame object to-morrow, it is obvious, that he who ſhould be laſt in the ſucceſſion could know nothing of the energy of that faculty by which the object was perceived the firſt day, becauſe there would be nothing common to the two perceptions.

Thus then we ſee, that *perſonal identity* may with truth be predicated of a compound being, though the material part be in a perpetual flux, provided the immaterial part remain unchanged; and that of ſuch a being only is a reſurrection from the dead poſſible.—For ſince the motions of the brain do nothing more than excite to energy the permanent powers of the mind, it is of no ſort of conſequence to that energy, whether theſe motions be continued by the ſame numerical atoms, or by a perpetual ſucceſſion of atoms arranged and combined in the very ſame manner. We ſhall, therefore, be the ſame perſons at the reſurrection as at preſent, whether the mind be united to a particular ſyſtem compoſed of any of the numberleſs atoms which have in ſucceſſion made parts of our preſent bodies, or to a ſyſtem compoſed of totally different atoms, provided that new ſyſtem be organiſed in exactly the ſame manner with the brain or material vehicle, which is at preſent the immediate inſtrument of perception. This (we ſay) is ſelf-evident; but were the immaterial part to change with the changing body, a reſurrection of the ſame perſons would be plainly impoſſible.

CHAP. IV. *Of the* IMMORTALITY *of the* SOUL.

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The immortality of the ſoul the general belief in all nations.

WHEREVER men have been in any degree civilized, and in ſome nations where they have been in the moſt ſavage ſtate, it has been the general perſuaſion, that the mind or ſoul ſubſiſts after the diſſolution of the body. The origin of this perſuaſion, about which diſputes have been raiſed, no Chriſtian heſitates to attribute to revelation. The Egyptians, from whom the Greeks derived many of their theological and philoſophical principles, appear to have taught the immortality of the ſoul, not as a truth diſcovered by the exertions of human reaſon, but as a dogma derived to them from the earlieſt ages by tradition. This indeed may be confidently inferred from the character and conduct of their firſt Greek diſciples. Thoſe early wiſe men who fetched their philoſophy immediately from Egypt, brought it home as they found it, in detached and independent placits. Afterwards, when ſchools were formed, and when man began to philoſophiſe by hypotheſis and ſyſtem, it was eagerly inquired upon what foundation in *nature* the belief of the ſoul's immortality could reſt; and this inquiry gave riſe to the various diſquiſitions concerning the *ſubſtance* of the ſoul, which have continued to exerciſe the ingenuity of the learned to the preſent day. It was clearly perceived, that if conſciouſneſs, thought, and volition, be the reſult of any particular modification of matter and motion, the living and thinking agent muſt periſh with the diſſolution of the ſyſtem; and it was no leſs evident, that if the being which perceives, thinks, and wills, be not material, the mind of man *may* ſubſiſt after the reſolution of the body into its component particles. The diſcovery of the immateriality of the mind was therefore one *ſtep towards* the proof of its immortality; and in the opinion of many philoſophers, whoſe hopes ought to reſt on a ſurer baſis, it was alone a complete proof.—"They who hold ſenſitive perception in brutes (ſays a pious writer †) to be an argument for the immateriality of their ſouls, find themſelves under the neceſſity of allowing thoſe ſouls to be immortal."

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The philoſophers of ancient Greece believed likewiſe in its pre-exiſtence,

The philoſophers of ancient Greece, however, felt not themſelves under any ſuch neceſſity. Whatever were their opinions reſpecting the ſouls of brutes, they clearly perceived that nothing which had a beginning of exiſtence could be naturally immortal, whether its ſubſtance were material or immaterial.—"There never was any of the ancients before Chriſtianity (ſays the accurate Cudworth), that held the ſoul's future permanency after death, who did not likewiſe aſſert its pre-exiſtence; they clearly perceiving, that if it were once granted that the ſoul was generated, it could never be proved but that it might be alſo corrupted. And, therefore, the aſſertors of the ſoul's immortality commonly began here, firſt to prove its pre-exiſtence, proceeding thence to eſtabliſh its permanency after death. This is the method of proof uſed in Plato: Ην που ἡμων ἡ ψυχη πριν εν τω δε τω ανθρωπινω ειδει γενεσθαι, ὡστε και ταυτη αθανατον τι εοικεν ἡ ψυχη ειναι. *Our ſoul was ſomewhere before it came to exiſt in this human form, and thence it appears to be immortal, and as ſuch will ſubſiſt after death.*"

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And abſolute eternity.

To give this argument for immortality any ſtrength, it muſt be taken for granted, not only that the ſoul exiſted in a *prior* ſtate, but that it exiſted from all *eternity*; for it is obvious, that if it had a beginning in any ſtate, it may have an end either in that ſtate or in another. Accordingly, Plato aſſerts in plain terms its eternity and ſelf-exiſtence, which, as we learn from Cicero, he infers from its being the principle of motion in man. "Quin etiam cæteris, quæ moventur, hic fons, hoc principium eſt movendi. *Principii autem nulla eſt origo.* Nam ex principio oriuntur omnia: ipſum autem nulla ex re alia naſci poteſt: nec enim eſſet id principium, quod gigneretur aliunde §." This, it muſt be acknowledged, is very contemptible reaſoning; but the opinion which it was intended to prove was held by all the philoſophers. They were unanimous in maintaining the *ſubſtance* of the ſoul, though not its *perſonality*, to be eternal *à parte ante* as well as *ad partem poſt*; and Cicero, where he tells us that this opinion paſſed from *Pherecydes*, *Syrus*, to Pythagoras, and from Pythagoras to *Plato*, expreſſes their notion of the ſoul's duration by the word *ſempiternus* *, which, in its original and proper ſenſe, is applicable only to that which has neither beginning nor end.

Indeed none of the philoſophers of ancient Greece appear to have believed a creation (ſee CREATION) poſſible: for it was a maxim univerſally received among them, *De nihilo nihil fit, in nihilum nil poſſe reverti*; that *nothing can come from nonentity, or go to nonentity.* This maxim, as held by the theiſtical philoſophers, the learned Cudworth labours to interpret in a ſenſe agreeable

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† See the Procedure, Extent, and Limits of the Underſtanding.

§ Tuſcul. lib. i. cap. 23.

* Tuſcul. lib. i.

able to our notions of the origin of the world ; but the quotations urged by himſelf muſt convince every competent reader that on this occaſion he labours in vain. For inſtance, when Ariſtotle writes of Parmenides and Meliſſus, that ουδεν ουδε γινεσθαι φασιν ουδε φθειρεσθαι των οντων, *they ſay that no real entity is either made or deſtroyed ;* what can be his meaning, but that thoſe philoſophers taught that nothing could be either created or annihilated ? He teſtifies the ſame thing of *Xenophones and Xeno*, when he ſays that it was a fundamental principle of their philoſophy—μη ενδεχεσθαι γινεσθαι μηδεν εκ μηδενος—*that it is impoſſible that any thing ſhould be made out of nothing.* And of Empedocles, when he relates απαντα ταυτα κακεινος ὁμολογει ὁτι εκ τε μη οντος αμηχανον εστι γινεσθαι το τε ον εξολλυσθαι ανηνυστον και αρρηκτον—*That he acknowledges the very ſame thing with other philoſophers*, viz. *that it is impoſſible that any thing ſhould be made out of nothing, or periſh into nothing.* But it is needleſs to multiply quotations reſpecting the opinions of ſingle philoſophers. Of all the phyſiologers before himſelf and Plato, Ariſtotle ſays, without exception, περι ταυτης ὁμογνωμονουσι της δοξης ὁι περι φυσεως, ὁτι το γιγνομενον εκ μη οντων γιγνεσθαι αδυνατον‡—*That they agree in this opinion, that it is impoſſible that any thing ſhould be made out of nothing :* and he calls this the common principle of naturaliſts ; plainly intimating, that they conſidered it as the greateſt abſurdity to ſuppoſe that any real entity in nature could either be brought from nothing or reduced to nothing.

‡ Phyſic. lib. 1. cap. 5.

The author of the *Intellectual Syſtem*, in order, perhaps, to hide the impiety of this principle, endeavours to perſuade his readers, that it was urged only againſt the hypotheſis of forms and qualities of bodies conſidered as real entities, diſtinct from matter. But how it could be ſuppoſed to militate againſt that particular opinion, and not againſt the poſſibility of all creation, is to us perfectly inconceivable. The father of the ſchool which analyſed body into matter and form, together with by far the greater part of his followers, taught the eternity of both theſe principles (L) ; and therefore maintained, as ſtrenuouſly as any atomiſt, the univerſal maxim, *De nihilo nihil fit.* Even Plato himſelf, whoſe doctrine of *ideas* is ſuppoſed to wear a more favourable aſpect than Ariſtotle's *forms* to the truths of revealed religion, taught the *eternity* of *matter ;* but whether as a ſelf-exiſting ſubſtance, or only as an emanation from the Deity, is a queſtion which has been diſputed. That he admitted no proper creation, may be confidently inferred from Plutarch ; who writing upon the generation of animals, according to the doctrine laid down in the *Timæus*, has the following paſſage : Βελτιον ουν, Πλατωνι πειθομενους τον μεν κοσμον υπο θεου γεγονεναι λεγειν και αδειν· ὁ μεν γαρ καλλιστος των γεγονοτων ὁ δε αριστος των αιτιων την δε ΟΥΣΙΑΝ και ΥΛΗΝ εξ ἡς γεγονεν ου γενομενην, αλλα ὑποκειμενην αει τῳ δημιουργῳ εις διαθεσιν και ταξιν αυτης, και προς εξομοιωσιν ως δυνατον ην παρασχειν· ου γαρ εκ του μη οντος ἡ γενεσις, αλλ' εκ του μη καλως μηδ' ἱκανως εχοντος, ὡς οικιας και ιματιου, και ανδριαντος†. *It is therefore better for us to follow Plato, and to ſay and ſing that the world was made by God. For as the world is the beſt of all works, ſo is God the beſt of all cauſes. Nevertheleſs, the* SUBSTANCE *or* MATTER *out of which the world was made, was* NOT *itſelf made, but was always ready at hand, and ſubject to the artificer, to be ordered and diſpoſed by him. For the making of the world was not the production of it out of nothing, but out of an antecedent bad and diſorderly ſtate, like the making of a houſe, garment, or ſtatue.*

† Plut. Op. tom. ii. p. 1014.

If, then, this be a fair repreſentation of the ſentiments of Plato, and ſurely the author underſtood thoſe ſentiments better than the moſt accompliſhed modern ſcholar can pretend to do, nothing is more evident, than that the founder of the academy admitted of no proper creation, but only taught that the matter which had exiſted from eternity in a chaotic ſtate, was in *time* reduced to order by the *Demiurgus*, or ſupreme Being. And if ſuch were the ſentiments of the divine Plato, we cannot heſitate to adopt the opinion of the excellent Moſheim, which the reader will probably be pleaſed to have in his own words. "Si a Judæis diſcedas, neſcio an ullus antiquorum philoſophorum mundum negaverit æternum eſſe. Omnes mihi æternum profeſſi videntur eſſe mundum : hoc uno vero disjunguntur, quod nonnulli, ut *Ariſtoteles*, *formam* et *materiam* ſimul hujus orbis, alii vero, quorum princeps facile Plato, *materiam* tantum *æternam*, formam vero, a Deo comparatam, dixerunt †."

† Notes on Cudworth's Intellectual Syſtem.

Now it is a fact ſo generally known, as not to ſtand in need of being proved by quotations, that there was not among them a ſingle man who believed in the exiſtence of mind as a being more excellent than matter, and eſſentially different from it, who did not hold the ſuperior of at leaſt equal antiquity with the inferior ſubſtance. So true is this, that Syneſius, though a Chriſtian, yet having been educated in one of the ſchools of philoſophy, could not by the hopes of a biſhopric be induced to diſſemble this ſentiment : αμελει την ψυχην ουκ αξιωσω ποτε σωματος ὑστερογενη νομιζειν*.—*I ſhall never be perſuaded to think my ſoul younger than my body.* This man probably believed upon the authority of the ſcriptures, that the matter of the viſible world was created in time ; but he certainly held with his philoſophic maſters, that his own ſoul was as old as any atom of it, and that it had conſequently exiſted in a prior ſtate before it animated his preſent body. Thoſe

* Epiſt. 105.

(L) *Ariſtotelem*, et pleroſque Peripateticorum, in vulgus notum eſt, in hac fuiſſe ſententia—nec *natum* eſſe, nec *interiturum* unquam hunc mundum. Vid. *Petrus Gassendus Phyſic.* ſect. 1. lib. 1. cap. 6. *Jac. Thomasius de Stoica mundi exuſtione*, Diſſ. 4. et alii. Plures ita haud dubie ſenſerunt philoſophorum veterum. Hinc video *Manilium* in *Aſtronomico Lib.* 1. inter philoſophorum de mundo ſententias hanc, ac ſi præcipua eſſet, primo commemorare loco :

Quem ſive ex nullis repetentem ſemina rebus,
NATALI QUOQUE EGERE *placet, ſemperque* FUISSE,
ET FORE, PRINCIPIO *pariter* FATOQUE *carentem.*

Moſheim's edition of Cudworth's Intellectual Syſtem, lib. i. cap. 3. ſect. 33. note 60. On this ſubject ſee alſo *Ancient Metaphyſics.*

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They ſuppoſed all ſouls to be emanations from the firſt mind;

Thoſe who maintained that the world was uncreated, maintained upon the ſame principle that their ſouls were uncreated likewiſe; and as they conceived all bodies to be formed of one firſt matter, ſo they conceived all ſouls to be either emanations from the one firſt Mind, or diſcerpted parts of it. Ariſtotle, who diſtinguiſhes between the intellectual and ſenſitive ſouls, ſays expreſsly of the former, that "it enters from without, and is DIVINE;" adding this reaſon for his opinion, that "its energy is not blended with that of the body—λειπεται δε τον νουν μονον θυραθεν επεισιεναι, και θειον ειναι μονον· ουδε γαρ αυτου τη ενεργεια κοινωνει σωματικη ενεργεια *. As to the Stoics, *Cleanthes* held (as Stobæus informs us †), that "every thing was made out of one, and would be again reſolved into one." But let Seneca ſpeak for them all: "Quid eſt autem, cur non exiſtimes in eo *divini* aliquid exiſtere, qui Dei PARS eſt? Totum hoc, quo continemur, et unum eſt, et Deus: et ſocii ejus ſumus, et membra ‖—*Why ſhould you not believe ſomething to be divine in him, who is indeed* PART OF GOD? *That* WHOLE *in which we are contained is* ONE, *and that one is* GOD; *we being his companions and* MEMBERS. Epictetus ſays, *The ſouls of men have the neareſt relation to God, as being* PARTS *or* FRAGMENTS *of him,* DISCERPTED *and* TORN *from his* SUBSTANCE: συναφεις τω θεω, ατε αυτου μορια ουσαι και αποσπασματα. Plato writes to the very ſame purpoſe, when, without any ſoftening, he frequently calls the ſoul *God*, and *part of God*. And Plutarch ſays, that "Pythagoras and Plato held the ſoul to be immortal; for that, launching out into the ſoul of the univerſe, it returns to its parent and original—Πυθαγορας, Πλατων, αφθαρτον ειναι την ψυχην· εξιουσαν γαρ εις την του παντος ψυχην, αναχωρειν προς το ομογενες †. Plutarch declares his own opinion to be, that "the ſoul is not ſo much the work and production of God, as a PART of him; nor is it made BY him, but FROM him, and OUT of him: η δε ψυχη ουκ εργον εστι μονον, αλλα και μερος· ουδ' ΥΠ' αυτου, αλλ' ΑΠ' αυτου, κα' ΕΞ αυτου γεγονεν *. But it is needleſs to multiply quotations. Cicero delivers the common ſentiments of his Greek maſters on this head, when he ſays §, "A natura deorum, ut doctiſſimis ſapientiſſimiſque placuit, HAUSTOS animos et LIBATOS habemus." And again: "Humanus autem animus DECERPTUS EX MENTE DIVINA: cum alio nullo, niſi cum ipſo Deo (ſi hoc fas eſt dictu), comparari poteſt."

* De Generatione Animalium lib. ii. cap. 3.

† Eclog. Phyſ. c. 20.

‖ Epiſt. 92.

† De Placitis Philoſophorum lib. iv. cap. 7.

* Plato Queſt.

§ De Divinatione, lib i. cap. 49.

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But differed in opinion as to the mode of their ſeparation.

Whilſt the philoſophers were thus unanimous in maintaining the ſoul to be a part of the ſelf-exiſtent Subſtance, they differed in opinion, or at leaſt expreſſed themſelves differently, as to the mode of its ſeparation from its divine parent. Cicero and the Stoics talk as if the Supreme Mind were extended, and as if the human ſoul were a part literally torn from that mind, as a limb can be torn from the body. The Pythagoreans and Platoniſts ſeem to have conſidered all ſouls as emanations from the divine Subſtance rather than as parts torn from it, much in the ſame way as rays of light are emanations from the ſun. Plato, in particular, believed in two ſelf-exiſtent principles, God and matter. The former he conſidered as the ſupreme Intelligence, incorporeal, without beginning, end, or change; and diſtinguiſhed it by the appellation of το αγαθον, *the Good*. Matter, as ſubſiſting from eternity, he conſidered as without any one *form* or *quality* whatever, and as having a natural tendency to diſorder. Of this chaotic maſs God formed a perfect world, after the eternal pattern of his own mind, and endowed it with a ſoul or emanation from himſelf. In the language of Plato, therefore, the univerſe being animated by a ſoul which proceeds from God, is called the *ſon of God;* and ſeveral parts of nature, particularly the heavenly bodies, are *gods*. The human ſoul, according to him, is derived by emanation from God, through the intervention of this ſoul of the world; and receding farther from the firſt intelligence, it is inferior in perfection to the ſoul of the world, though even that ſoul is debaſed by ſome material admixture. To account more fully for the origin and preſent ſtate of human ſouls, Plato ſuppoſes *, that "when God formed the univerſe, he ſeparated from the ſoul of the world inferior ſouls, equal in number to the ſtars, and aſſigned to each its proper celeſtial abode; but that thoſe ſouls, (by what means, or for what reaſon, does not appear), were ſent down to the earth into human bodies, as into ſepulchres or priſons." He aſcribes to this cauſe the depravity and miſery to which human nature is liable; and maintains, that it "is only by diſengaging itſelf from all animal paſſions, and riſing above ſenſible objects, to the contemplation of the world of intelligence, that the ſoul of man can be prepared to return to its original ſtate." Not inconſiſtently with this doctrine, our philoſopher frequently ſpeaks of the ſoul of man as conſiſting of three parts: or rather he ſeems to have thought that man has three ſouls; the firſt the principle of intelligence, the ſecond of paſſion, and the third of appetite (M); and to each he aſſigns its proper place in the human body. But it was only the intellectual ſoul that he conſidered as immortal.

* Enfield's Abridgement of Brucker's Hiſtory of Philoſophy.

Ariſtotle

(M) "Plato triplicem finxit animam; cujus principatum, id eſt, rationem, in capite, ſicut in arce, poſuit: et duas partes ſeparare voluit, iram et cupiditatem, quas locis diſcluſit; iram in pectore, cupiditatem ſubter precordia locavit." *Ciceronis Tuſc. Queſt.* lib. i. cap. 10.

This hypotheſis has been adopted by the learned author of Ancient Metaphyſics: but it cannot be proved by argument, and is in direct oppoſition to conſciouſneſs. Were there three diſtinct minds in each man—the principles of intelligence, of paſſion, and of appetite, it is obvious that *each man* would be *three perſons*, and that *none* of theſe perſons could know any thing of the powers and properties of the *other two.* The intelligent perſon could not reaſon about *paſſion*, or *appetite;* nor could the perſons who know nothing but paſſion and appetite reaſon about *intelligence*, or indeed about any thing elſe. The very queſtion at iſſue, therefore, furniſhes the moſt complete proof poſſible, that the ſame individual which each man calls himſelf, is the principle of intelligence, of paſſion, and of appetite; for if the Platonic hypotheſis were true, that queſtion could never have been ſtarted, as no one individual of the human race could have underſtood of its terms. It may be juſt worth while to mention, that the author of Ancient Metaphyſics, attributing all motion, Of the Immortality of the Soul.

Ariſtotle taught, in terms equally expreſs, that the human ſoul is a part of God, and of courſe that its ſubſtance is of eternal and neceſſary exiſtence. Some of his followers, indeed, although they acknowledged *two firſt principles*, the active and the paſſive, yet held, with the Stoics, but *one ſubſtance* in the univerſe; and to reconcile theſe two contradictory propoſitions, they were obliged to ſuppoſe matter to be both active and paſſive. Their doctrine on this ſubject is thus delivered by Cicero: "De natura ita dicebant, ut eam dividerent in res duas, ut altera eſſet efficiens, altera autem quaſi huic ſe præbens, ea quæ efficeretur aliquid. In eo, quod efficeret, vim eſſe cenſebant; in eo autem quod efficeretur, materiam quandam; in UTROQUE TAMEN UTRUMQUE. Neque enim materiam ipſam cohærere potuiſſe, ſi nulla vi contineretur, neque VIM SINE ALIQUA MATERIA; nihil eſt enim, quod non alicubi eſſe cogatur[†]." *They divided nature into two things, as the firſt principles; one whereof is the efficient or artificer, the other that which offers itſelf to him for things to be made out of it. In the efficient principle, they acknowledged active force; in the paſſive, a certain matter; but ſo, that in EACH BOTH OF THESE WERE TOGETHER: foraſmuch as neither the matter could cohere together unleſs it were contained by ſome active force, nor THE ACTIVE FORCE SUBSIST OF ITSELF WITHOUT MATTER; becauſe that is nothing which may not be compelled to be ſome where.* Agreeably to this ſtrange doctrine, Arrian, the interpreter of Epictetus, ſays of himſelf, ειμι ανθροπος, μερος των παντων, ὡς ὥρα ἡμερας, "I am a man (a part of the το παν or *univerſe*), as an hour is part of the day.

Ariſtotle himſelf is generally ſuppoſed to have believed in the eternal exiſtence of two ſubſtances, *mind* and *matter*; but treating of the generation of animals, he ſays, ενδε το παντι θερμοτης ψυχικη, ως τροπον τινα παντα ψυχης ειναι πληρη διο συνισταται ταχεως ὁποταν εμπεριληφθη[*], *In the univerſe there is a certain animal heat, ſo as that after a manner all things are full of mind; wherefore they are quickly completed (or made complete animals) when they have received a portion of that heat.* This *heat*, from which, according to Cicero[‡], the Stagyrite derived all ſouls, has, it muſt be confeſſed, a very material appearance; in ſo much that the learned Moſheim ſeems to have been doubtful whether he admitted of any immaterial principle in man; but for this doubt there appears to us to be no ſolid foundation. Ariſtotle expreſsly declares, that *this heat is not fire* nor any *ſuch power, but a ſpirit which is in the ſeeds or elementary principles of bodies*; τουτο δε ου πυρ, ουδε τοιαυτη δυναμις εστιν, αλλα το εμπεριλαμβανομενον εν τω σπερματι και εν τω αφρωδει πνευμα[*]. And as the excellent perſon himſelf acknowledges (N), that Ariſtotle taught the exiſtence of two principles, God and matter, not indeed ſubſiſting ſeparately, but eternally linked together by the cloſeſt union; we think it follows undeniably, that this heat, from which he derived all ſouls, muſt be that mind which he called *God*, and which he conſidered as the actuating ſoul of the univerſe.

Upon theſe principles neither Ariſtotle nor the Stoics could believe with Plato, that in the order of nature there was firſt an emanation from the ſupreme mind to animate the univerſe, and then through this univerſal ſoul other emanations to animate mankind. The Stagyrite believed, that the Supreme Mind himſelf is the ſoul of the world, and that human ſouls are immediately derived from him. The genuine Stoics, acknowledging but one ſubſtance, of neceſſity conſidered both the ſouls and bodies of men as portions of that ſubſtance, which they called το εν; though ſtill they affected to make ſome uninteligible diſtinction between body and mind. But however the various ſchools differed as to thoſe points, they were unanimous as to the ſoul's being a part of the ſelf-exiſting Subſtance; and Cicero gives their whole ſyſtem from Pacuvianus in words which cannot be miſunderſtood:

Quicquid eſt hoc, omnia amat, format, alit, auget, creat,
Sepelit, recipitque in ſeſe omnia, omniumque idem eſt Pater:
Indidemque eadem, quæ oriuntur de integro, atque eodem occidunt.

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Upon theſe principles they maintained the neceſſary exiſtence of the ſoul;

To theſe verſes he immediately ſubjoins the following query: "Quid eſt igitur, cur, cum domus ſit omnium una, eaque communis, cumque *animi hominum* SEMPER FUERINT, FUTURIQUE SINT cur ii, quid ex quoque eveniat, et quid quamque rem ſignificet, perſpicere non poſſint[‖]?" And upon the ſame principle he elſewhere argues, not merely for the immortality, but for the *eternity* and *neceſſary exiſtence* of the ſoul: "Animorum nulla in terris origo invenire poteſt: His enim in naturis nihil ineſt, quod vim memoriæ mentis, cogitationis habeat; quod et præterita teneat, et futura provideat, et complecti poſſit præſentia: quæ ſola divina ſunt. Nec invenietur unquam, unde ad hominem venire poſſint, niſi a Deo. Ita quicquid eſt illud, quod ſentit, quod ſapit, quod vult, quod viget, celeſte et divinum eſt OB EAMQUE REM ÆTERNUM SIT NECESSE EST[*]." This was indeed ſecuring the future permanency of the ſoul in the moſt effectual manner; for it is obvious, that what had not a beginning can never have an end, but muſt be of eternal and neceſſary exiſtence.

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But not in its diſtinct and perſonal capacity.

But when the ancients attribute a proper eternity to the ſoul, we muſt not ſuppoſe that they underſtood it to be eternal in its *diſtinct* and *perſonal exiſtence*. They believed that it proceeded or was *diſcerpted* in *time* from the

[†] Academicum, lib. i. cap. 6.

[*] De Generatione Animalium, lib. iii. c. 11.

[‡] Tuſcul. lib. i. c. 3.

[*] De Generatione Animalium, lib. ii. c. 3.

[‖] De Divinatione, lib. i, cap. 57.

[*] Frag de Conſolatione.

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tion, and even the coherence of the minute particles of body, to the immediate agency of mind, of courſe furniſhes every human body with at leaſt *four minds.* This fourth mind differs not from the *plaſtic nature* of Cudworth, and is likewiſe a Platonic notion apparently better founded. That there are in our bodies motions perpetually carried on by the agency of ſomething which is not the principle of either our intelligence, our paſſions, or our appetites, is a fact which cannot be denied; but if thoſe motions proceed immediately from mind, it muſt be either from the *ſupreme* mind, or from ſome *ſubordinate* mind, acting under the ſupreme, but wholly *diſtinct from and independent* of that which each man calls himſelf.

(N) "Non cum illis componi prorſus poteſt ARISTOTELES, qui bina rerum ſeparataque ſtatuunt principia, Deum et materiam. Arctiſſime enim utrumque hoc initium conjunxit Stagyrita, atque ipſa naturæ neceſſitate Deum cohærere cum mole hac corporea putavit." *Cudworth's Intellectual Syſtem,* Book I. Chap iv. Sect. 6. Note 3.

the ſubſtance of God, and would *in time* be again *reſolved* into that ſubſtance. This they explained by a cloſed veſſel filled with ſea-water; which ſwimming a while upon the ocean, does, on the veſſel's breaking flow in again, and mingle with the common maſs. They only differed about the time of this reunion; the greater part holding it to be at death; but the Pythagoreans not till after many tranſmigrations. The Platoniſts went between theſe two opinions; and rejoined pure and unpolluted ſouls immediately to the Univerſal Spirit; but thoſe which had contracted much defilement, were ſent into a ſucceſſion of other bodies, to be purged and purified, before they returned to their parent ſubſtance. ‡"

‡ Warburton's Divine Legation.

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A ſimilar doctrine held by the Bramins.

A doctrine ſimilar to this of Plato has been held from time immemorial by the Bramins in India, whoſe ſacred books teach, "That intellect is a PORTION of the GREAT SOUL of the univerſe, breathed into all creatures, to animate them for a certain time; that after death it animates other bodies, or returns like a *drop* into that *unbounded ocean* from which it firſt aroſe; that the ſouls of men are diſtinguiſhed from thoſe of other animals, by being endowed with reaſon and with a conſciouſneſs of right and wrong; and that the ſoul of him who adheres to right as far as his powers extend, is at death ABSORBED INTO THAT DIVINE ESSENCE, never more to reanimate fleſh. On the other hand, the ſouls of thoſe who do evil, are not at death diſengaged from all the elements; but are immediately cloathed with a body of fire, air, and *akaſh* (a kind of celeſtial element, through which the planets move, and which makes no reſiſtance) in which they are for a time puniſhed in hell. After the ſeaſon of their grief is over, they reanimate other bodies; and when they arrive through theſe tranſmigrations at a ſtate of purity, they are abſorbed into God, where all PASSIONS are UTTERLY UNKNOWN, and where CONSCIOUSNESS IS LOST IN BLISS ‡."

‡ See preliminary Diſſertion to Dow's Hiſtory of Indoſtan.

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This doctrine incompatible with a future ſtate of rewards and puniſhments, and

Whether the Greeks derived their notions of the divinity and tranſmigration of ſouls from the eaſt, or whether both they and the Bramins brought the ſame doctrines at different periods from Egypt, it is foreign from the purpoſe of this article to inquire. Certain it is, that the philoſophers of Greece and India argued in the very ſame manner, and upon the very ſame principles, for the *natural* immortality of the ſoul; and that the immortality which they taught was wholly incompatible with God's moral government of the world, and with a future ſtate of rewards and puniſhments. That this is true of the doctrine of the Bramins, is evident from the laſt quoted ſentence; for if the ſoul, when abſorbed into the Divine eſſence, loſes all conſciouſneſs of what it did and ſuffered in the body, it cannot poſſibly be rewarded for its virtues practiſed upon earth. That the philoſophers of Greece taught the ſame ceſſation of conſciouſneſs, might be inferred with the utmoſt certainty, even though we had not Ariſtotle's expreſs declaration to that purpoſe: For as they all believed their ſouls to have exiſted before they were infuſed into their bodies, and as each muſt have been conſcious that he remembered nothing of his former ſtate (o), it was impoſſible to avoid concluding, that in the future ſtate of his ſoul as little would be remembered of the preſent. Accordingly, Ariſtotle teaches, that "the agent intellect only is immortal and eternal, but the paſſive corruptible",—τουτο μονον αθανατον και αιδιον ὁ δε παθητικος νους φθαρτος *. Cudworth thinks this a very doubtful and obſcure paſſage; but Warburton, whoſe natural acuteneſs often diſcovered the ſenſe of ancient authors when it had eſcaped the ſagacity of abler ſcholars, has completely proved, that by the *agent intellect* is meant the *ſubſtance* of the ſoul, and by the *paſſive* its *particular perceptions*. It appears therefore that the Stagyrite, from the common principle of the ſoul's being a part of the Divine ſubſtance, draws a concluſion againſt a future ſtate of rewards and puniſhments; which though all the philoſophers (except Socrates) embraced, yet all were not ſo forward to avow.

* De Anima, lib. iii. cap. 6.

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Groſsly abſurd in itſelf;

That the hypotheſis of the ſoul's being a part of the Divine ſubſtance is a groſs abſurdity, we ſurely need not ſpend time in proving. The argument long ago urged againſt it by St Auſtin muſt ere now have occurred to every reader. In the days of that learned father of the church, it was not wholly given up by the philoſophers; and in his excellent work of the *City of God*, he thus expoſes its *extravagance* and impiety: "Quid infelicius credi poteſt, quam dei partem vapulare, cum puer vapulat? Jam vero *partes Dei* fieri *laſcivas*, *iniquas*, *impias*, atque omnino *damnabiles*, quis ferre poteſt niſi qui prorſus inſanit?"

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Yet the only principle from which the ſoul can be inferred to be eſſentially immortal.

But though this hypotheſis be in the higheſt degree abſurd and wholly untenible, we apprehend it to be the only principle from which the *natural* or *eſſential* immortality of the ſoul can poſſibly be inferred. If the ſoul had a *beginning*, it *may* have an *end*; for nothing can be more evident than that the being which had not exiſtence of itſelf cannot of itſelf have perpetuity of exiſtence. Human works, indeed, continue in being after the power of the workman is withdrawn from them; but between human works and the Divine there is this immenſe difference, that the former receive from the artiſt nothing but their form; whereas the latter receive from the Creator both their form and their ſubſtance. Forms are nothing but modifications of ſubſtance; and as ſubſtances depend upon God and not upon man, human works are continued in being by that fiat of the Creator, which made the ſubſtances of which they are compoſed ſuſceptible of different forms, and of ſuch a nature as to retain for a time whatever form may be impreſſed upon them. Human works therefore are continued in being by a power different from that by which they are finiſhed; but the works of God depend wholly upon that power by which they were originally brought into exiſtence; and were the Creator to withdraw his ſupporting energy, the whole creation would ſink into nothing.

(o) This is expreſsly acknowledged by Cicero, though he held with his Greek maſters the eternity of the ſoul. In anſwer to ſome very fooliſh aſſertions concerning the evil of death, he ſays, "Ita, qua nondum dati ſunt, miſeri jam ſunt, quia non ſunt: et nos ipſi, ſi poſt mortem miſeri futuri ſumus, miſeri fuimus antequam nati. Ego autem *non commemini, antequam ſum natus, me miſerum*. *Tuſcul.* lib. 1. cap. 6.

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Baxter's argument for the natural or eſſential immortality of the ſoul.

Self-evident as this truth certainly is, ſome eminent philoſophers *ſeem* to have queſtioned it. "No ſubſtance or being (ſays Mr Baxter*) can have a natural tendency to annihilation, or to become nothing. That a being which once exiſts ſhould ceaſe to exiſt is a real effect, and muſt be produced by a real cauſe: But this cauſe could not be planted in the nature of any ſubſtance or *being* to become a tendency of its nature; *for it could not be a free cauſe*, otherwiſe it muſt be a *being* itſelf, the ſubject of the *attribute freedom*, and therefore not the property of another *being*; *nor a neceſſary cauſe*, for ſuch a cauſe is only the effect of ſomething impoſing that neceſſity, and ſo no cauſe at all."

* Inquiry into the Nature of the human Soul, vol. i. ſect. 3.

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Inconcluſive,

That the author's meaning in this argument is good, cannot, we think, be controverted; but he has not expreſſed himſelf with his uſual accuracy. He ſeems to confound *cauſes* with the *abſence* of cauſes, and the *effects* of the *former* with the *conſequences* of the *latter*. The viſible world was brought into exiſtence by the actual energy of the power of God; and as the viſible world had nothing of itſelf, it can *remain* in exiſtence only by a *continuance* of the *ſame energy*. This energy therefore is at the preſent moment as *real a cauſe* as it was ſix thouſand years ago, or at any paſt period when it may have been firſt exerted; and the viſible world is its *real and permanent effect*. But would the ceaſing of this energy be likewiſe a *cauſe?* It would certainly be followed with the annihilation of the viſible world, juſt as the withdrawing of the ſun-beams would be followed with darkneſs on the earth. Yet as no one has ever ſuppoſed that darkneſs, a non-entity, is a *poſitive effect* of the ſun or of his beams, but only a mere negative conſequence of their abſence; ſo, we think, no one who believes in creation can conſider that deſtruction which would inevitably follow the withdrawing of the energy by which all things are ſupplied, as the *poſitive effect* of a contrary energy, or as any thing more than a *negative conſequence* of the ceaſing of that volition or energy of power by which God at firſt brought things into exiſtence. For "where the *foundation* of exiſtence lies *wholly* in the power of an infinite Being *producing*, the *ground* of the *continuance* of that exiſtence muſt be wholly in the ſame power *conſerving*; which has, therefore, with as much truth as frequency, been ſtyled a continued creation (P)."

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and in effect given up by himſelf.

The force of this reaſoning Mr Baxter certainly ſaw when he ſaid, that "a tendency to perſevere in the ſame ſtate of nature, and a tendency to change it are contradictories, and impoſſible to be planted in the ſame ſubject at once; or, not to urge the contradiction, if the laſt prevailed, the remaining in the ſame ſtate for any given time would be impoſſible. We forget the true cauſe of all theſe tendencies, *the will of God*, which it is abſurd to ſuppoſe contrary to itſelf. The tendency in matter to perſevere in the ſame ſtate of reſt or motion, is nothing but *the will of the Creator*, who preſerves all things in their exiſtence and manner of exiſtence: nor can we have recourſe to any other cauſe for the preſervation of immaterial ſubſtance in its exiſtence. Therefore theſe tendencies are to be aſcribed to the will of God, and it is abſurd to ſuppoſe them contrary."

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Analogical evidence of the immortality of the ſoul, and a moral proof of a future ſtate of rewards and puniſhments.

All this is unqueſtionably true. The exiſtence or non-exiſtence of matter and created ſpirits depends wholly upon the will of God; and we cannot ſuppoſe him to be willing to-day the reverſe of what he willed yeſterday, becauſe we know that all his volitions are directed by unerring wiſdom. We have likewiſe the evidence of experience, that nothing is ever ſuffered to periſh but particular ſyſtems, which periſh only *as ſyſtems* by a decompoſition of their parts. A being which like the ſoul has no parts, can ſuffer no decompoſition; and therefore, if it periſh, it muſt periſh by annihilation. But of annihilation there has not hitherto been a ſingle inſtance; nor can we look for a ſingle inſtance without ſuppoſing the volitions of God to partake of that unſteadineſs which is characteriſtic of man. Corporeal ſyſtems, when they have ſerved their purpoſe, are indeed reſolvable into their component parts; but the matter of which they are compoſed, ſo far from being *loſt*, becomes the matter of *other ſyſtems* in endleſs ſucceſſion. Analogy, therefore, leads us to conclude, that when the human body is diſſolved, the immaterial principle by which it was animated continues to think and act, either in a ſtate of ſeparation from all body, or in ſome material vehicle to which it is intimately united, and which goes of with it at death; or elſe that it is preſerved by the Father of ſpirits, for the purpoſe of animating a body in ſome future ſtate. When we conſider the different ſtates through which that living and thinking *individual* which each man calls himſelf, goes, from the moment that it firſt animates an embryo in the womb, to the diſſolution of the man of fourſcore; and when we reflect likewiſe on the wiſdom and *immutability* of God, together with the various diſſolutions of corporeal ſyſtems, in which we know that a ſingle atom of matter has never been loſt; the preſumption is certainly ſtrong, that the ſoul ſhall ſubſiſt after the diſſolution of the body. But when we take into the conſideration the *moral* attributes of God—his juſtice and goodneſs, together with the unequal diſtribution of happineſs and miſery in the preſent world; this preſumption from analogy amounts to *complete moral proof* that there ſhall be a future ſtate of rewards and puniſhments (Q) (See MORAL *Philoſophy* and RELIGION); and if we eſtimate the duration of the rewards by the benevolence of Him by whom they are to be conferred, we cannot imagine them ſhorter than eternity.

(P) See Stillingfleet's *Origines Sacræ*, where this queſtion is treated in a very maſterly manner by one of the ableſt metaphyſicians of the laſt century. See alſo our article PROVIDENCE.

(Q) It was by ſuch arguments that Socrates reaſoned himſelf into the belief of a future ſtate of rewards and puniſhments. He was ſingular, as we have already obſerved, in this belief; and he was as ſingular in confining himſelf to the ſtudy of morality. "What could be the cauſe of this belief, but this reſtraint, of which his belief was a natural conſequence? For having confined himſelf to morals, he had nothing to miſlead him; whereas the reſt of the philoſophers, applying themſelves with a kind of fanaticiſm to *phyſics* and *metaphyſics*, had drawn a number of abſurd though ſubtile concluſions, which directly oppoſed the conſequences of thoſe moral arguments." *Warburton's Div. Leg.*

CHAP. V. *Of* NECESSITY *and* LIBERTY.

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Freedom of agency implied in accountableneſs.

In the preceding chapter we have adverted to that great *moral proof* for a future ſtate, and the immortality of the ſoul, ariſing from the relation in which man, as a being accountable for his conduct, ſtands to a God of almighty power, infinite wiſdom, and perfect juſtice. But the circumſtance of accountableneſs implies freedom of agency; for it is contrary to all our notions of right and wrong (ſee MORAL *Philoſophy*), that a man ſhould be either rewarded or puniſhed for actions which he was neceſſitated or compelled to perform.

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Every man has power to do what he wills:

Human actions are of three kinds: one, where we act by inſtinct without any view to conſequences; one, where we act by will, in order to obtain ſome end; and one, where we act againſt will. It is the ſecond kind of actions only which confers upon the agent merit or demerit. With reſpect to the firſt, he acts blindly (ſee INSTINCT), without deliberation or choice; and the external act follows from the inſtinctive impulſe, no leſs neceſſarily than a ſtone by its gravity falls to the ground. With reſpect to the laſt, he is rather an inſtrument than an agent; and it is univerſally allowed, that were a ſtrong man to put a ſword into the hand of one who is weaker, and then to force it through the body of a third perſon, he who held the ſword would be as guiltleſs of the murder as the ſword itſelf. To be intitled to rewards, or liable to puniſhment, a man muſt act voluntarily; or in other words, his actions muſt proceed from that energy of mind which is termed *volition:* and, we believe, it has never been denied, that all men have power to do whatſoever they *will*, both with reſpect to the operations of their minds and the motion of their bodies, uncontrolled by any foreign principle or cauſe. "Every man (ſays Prieſtley) is at liberty to turn his thoughts to whatever ſubject he pleaſes, to conſider the reaſons for or againſt any ſcheme or propoſition, and to reflect upon them as long as he ſhall think proper; as well as to walk wherever he pleaſes, and to do whatever his hands or other limbs are capable of doing." Without ſuch liberty as this, morality is inconceivable.

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But different opinions entertained of the freedom of volition.

But though philoſophers have in general agreed with reſpect to the power which a man has to perform ſuch actions as he wills, they have differed widely in opinion reſpecting the nature of his volitions. That theſe are the reſult of motives, has ſeldom if ever been queſtioned; but whether that reſult be neceſſary, ſo as that the agent has no ſelf-determining power to decide between different motives, has been warmly diſputed by men equally candid, impartial, and intelligent. The principal writers on the ſide of neceſſity are, Hobbes, Collins, Hume, Leibnitz, Lord Kames, Hartley, Edwards, Prieſtley, and perhaps Locke. On the other ſide are, Clarke, King, Law, Reid, Butler, Price, Bryant, Wollaſton, Horſley, Beattie, and Gregory, &c. To give a ſhort view of this celebrated queſtion, is all that our limits will permit; and as we do not think ourſelves competent to ſettle the diſpute, it were perhaps a thing deſirable to give the oppoſite reaſonings in the words of thoſe eminent authors themſelves. It muſt, however, be obvious to the reader, that the ſtyle and manner of ſo many different writers are extremely various, and that to introduce them all into our abſtract, would make the whole a maſs of confuſion. We ſhall, therefore, ſelect one writer to plead the cauſe of neceſſity, ſupplying his defects from thoſe who, though inferior to him on the whole, may yet have argued more ably on ſome particular points which the queſtion involves: and to this combined reaſoning we ſhall ſubjoin ſuch anſwers as to us appear moſt concluſive. Hartley, Hume, and Prieſtley, are perhaps the moſt profound reaſoners on the ſide of neceſſity; but there is ſo much more perſpicuity in the arguments of Lord Kames, that we cannot help preferring them, as being on the whole better calculated to give the ordinary reader a fair view of the ſubject.

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Scheme of neceſſity, according to Lord Kames.

"Into actions done with a view to an end (ſays his Lordſhip §), deſire and will enter: deſire to accompliſh the end goes firſt; the will to act, in order to accompliſh the end, is next; and the external act follows of courſe. It is the will then, that governs every external act done as a mean to accompliſh an end; and it is deſire to accompliſh the end that puts the will in motion; deſire, in this view, being commonly termed the *motive* to act. But what is it that raiſes deſire? The anſwer is ready: It is the proſpect of attaining ſome agreeable end, or evading one that is diſagreeable. And if it be enquired, what makes an object agreeable or diſagreeable? the anſwer is equally ready: It is our nature that makes it ſo. Certain viſible objects are agreeable, certain ſounds, and certain ſmells: other objects of theſe ſenſes are diſagreeable. But there we muſt ſtop, for we are far from being ſo intimately acquainted with our own nature as to aſſign the cauſes.

"With reſpect to inſtinctive actions, no perſon, I preſume, thinks that there is any freedom. With reſpect to voluntary actions, done in order to produce ſome effect, the neceſſity is the ſame, though leſs apparent at firſt view. The external action is determined by the will; the will is determined by deſire; and deſire by what is agreeable or diſagreeable. Here is a chain of cauſes and effects, not one link of which is arbitrary, or under command of the agent: he cannot will but according to his deſire; he cannot deſire but according to what is agreeable or diſagreeable in the objects perceived: nor do theſe qualities depend on his inclination or fancy; he has no power to make a beautiful woman ugly, nor to make a rotten carcaſe ſmell ſweetly.

"Many good men, apprehending danger to morality from holding our actions to be neceſſary, endeavour to break the chain of cauſes and effects abovementioned; maintaining, that whatever influence deſire or motives may have, it is the agent himſelf who is the cauſe of every action; that deſire may adviſe, but cannot command; and, therefore, that a man is ſtill free to act in conradiction to deſire and to the ſtrongeſt motives.

"That a being may exiſt which in every caſe acts blindly and arbitrarily, without having any end in view, I can make a ſhift to conceive: but it is difficult for me even to imagine a thinking and rational being, that has affections and paſſions, that has a deſirable end in view, that can eaſily accompliſh this end; and yet after all can fly off or remain at reſt, without any cauſe, reaſon, or motive, to ſway it. If ſuch a whimſical being can poſſibly exiſt, I am certain that man is not that being. There is not perhaps a perſon above the condition of a changeling, but can ſay *why* he did ſo and ſo, what moved him, what he intended. Nor is a ſingle fact ſtated to make us believe that ever a man acted againſt his own will or deſire who was not compelled by external force.— On the contrary, conſtant and univerſal experience proves, that human actions are governed by certain inflexible laws; and that a man cannot exert his ſelf-motive power but in purſuance of ſome deſire or motive.

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§ Sketches of the Hiſtory of Man, Book iii. Sketch 2. part 1. ſect. 8.

“Had a motive always the ſame influence, actions proceeding from it would appear no leſs neceſſary than the actions of matter. The various degrees of influence that motives have on different men at the ſame time, and on the ſame man at different times, occaſion a doubt, by ſuggeſting a notion of chance. Some motives, however, have ſuch influence as to leave no doubt: a timid female has a phyſical power to throw herſelf into the mouth of a lion roaring for food; but ſhe is with-held by terror no leſs effectually than by cords: if ſhe ſhould ruſh upon a lion, would not every one conclude that ſhe was a frantic? A man, though in a deep ſleep, retains a phyſical power to act, but he cannot exert it. A man, though deſperately in love, retains a phyſical power to refuſe the hand of his miſtreſs; but he cannot exert that power in contradiction to his own ardent deſire, more than if he were faſt aſleep. Now, if a ſtrong motive have a neceſſary influence, there is no reaſon for doubting, but that a weak motive muſt alſo have its influence, the ſame in kind, though not in degree. Some actions indeed are ſtrangely irregular; but let the wildeſt actions be ſcrutiniſed, there will always be diſcovered ſome motive or deſire, which, however whimſical or capricious, was what influenced the perſon to act. Of two contending motives, is it not natural to expect that the ſtronger will prevail, however little its exceſs may be? If there be any doubt, it muſt ariſe from a ſuppoſition, that a weak motive may be reſiſted arbitrarily. Where then are we to fix the boundary betwixt a weak and a ſtrong motive? If a weak motive can be reſiſted, why not one a little ſtronger, and why not the ſtrongeſt? Between two motives oppoſing each other, however nearly balanced, a man has not an arbitrary choice, but muſt yield to the ſtronger. The mind, indeed, fluctuates for ſome time, and finds itſelf in a meaſure looſe: at laſt, however, it is determined by the more powerful motive, as a balance is by the greater weight after many vibrations.

“Such, then, are the laws that govern our voluntary actions. A man is abſolutely free to act according to his own will; greater freedom than which is not conceivable. At the ſame time, as man is made accountable for his conduct to his Maker, to his fellow-creatures, and to himſelf, he is not left to act arbitrarily; for at that rate he would be altogether unaccountable: his will is regulated by deſire; and deſire by what pleaſes or diſpleaſes him.—Thus, with regard to human conduct, there is a chain of laws eſtabliſhed by nature; no one link of which is left arbitrary. By that wiſe ſyſtem, man is made accountable; by it he is made a fit ſubject for divine and human government; by it perſons of ſagacity foreſee the conduct of others; and by it the preſcience of the Deity with reſpect to human actions is clearly eſtabliſhed.”

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Mr Hume, and

Of the doctrine of neceſſity, a more perſpicuous or plauſible view than this is not to be found in any work with which we are acquainted. It is indeed defective perhaps, as his Lordſhip only *hints* at the *nature* of that relation which ſubſiſts between motive and action; but from his comparing the fluctuations of the mind between two contending motives, to the vibrations of a balance with different weights in the oppoſite ſcales, there is no room to doubt but that he agreed exactly in opinion with Mr Hume and Dr Prieſtley. Now both theſe writers hold, that the relation of motives to volition and action, is the very ſame with that which ſubſiſts between cauſe and effect in phyſics, as far as they are both known to us. “It is univerſally allowed (ſays Mr Hume †), that matter, in all its operations is actuated by a neceſſary force; and that every natural effect is ſo preciſely determined by the energy of its cauſe, that no other effect, in ſuch particular circumſtances, could poſſibly have reſulted from it. The degree and direction of every motion is, by the laws of nature, preſcribed with ſuch exactneſs, that a living creature may as ſoon ariſe from the ſhock of two bodies, as motion in any other degree or direction than what is actually produced by it. Would we, therefore, form a juſt and preciſe idea of *neceſſity*, we muſt conſider whence that idea ariſes, when we apply it to the operation of bodies. But our idea of this kind of neceſſity and cauſation ariſes entirely from the uniformity obſervable in the operations of nature, where ſimilar objects are conſtantly conjoined together, and the mind is determined by cuſtom to infer the one from the appearance of the other. Theſe two circumſtances form the whole of that neceſſity which we aſcribe to matter. Beyond the *conſtant conjunction* of ſimilar objects, and the conſequent *inference* from one to the other, we have no notion of any neceſſity or connection.” He then gives a pretty long detail to prove a great uniformity among the actions of men in all nations and ages; and concludes that part of his argument with affirming, “not only that the conjunction between motives and voluntary actions is as regular and uniform as that between the cauſe and effect in any part of nature; but alſo, that this regular conjunction has been univerſally acknowledged among mankind, and has never been the ſubject of diſpute either in philoſophy or common life.” He afterwards obſerves, “that men begin at the wrong end of this queſtion concerning liberty and neceſſity, when they enter upon it by examining the faculties of the ſoul, the influence of the underſtanding, and the operations of the will. Let them firſt diſcuſs a more ſimple queſtion, namely, the operations of body, and of brute unintelligent matter; and try whether they can there form any idea of cauſation and neceſſity, except that of a conſtant conjunction of objects and ſubſequent inference of the mind from one to another. If theſe circumſtances form in reality the whole of that neceſſity which we conceive in matter, and if theſe circumſtances be alſo univerſally acknowledged to take place in the operations of the mind, the diſpute is at an end; at leaſt muſt be owned to be thenceforth merely verbal. When we conſider how aptly *natural* and *moral* evidence link together, and form only one chain of argument, we ſhall make no ſcruple to allow that they are of the ſame nature, and derived from the ſame principles.—Between a connected chain of natural cauſes and voluntary actions, the mind feels no difference in paſſing from one link to another; nor is leſs certain of a future event which depends upon motives and volitions, than if it were connected with the objects preſent to the memory and ſenſes by a train of cauſes, cemented together by what we are pleaſed to call a *phyſical* neceſſity. The ſame experienced union has the ſame effect on the mind, whether the united objects be motives, volition and action, or figure and motion. We may change the names of things, but their nature and their operation on the underſtanding never change."

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† Inquiry concerning Human Underſtanding, ſect. 8.

282 Dr Prieſtley.

Dr Prieſtley, in words a little different, teaches the very ſame doctrine which was taught by Mr Hume.—"In every determination of the mind (ſays he *), or in caſes where volition and choice are concerned, all the previous circumſtances to be conſidered are the *ſtate of mind* (including *every thing belonging to the will itſelf*), and the *views of things* preſented to it; the latter of which is generally called the *motive*, though under this term ſome writers comprehend them both. To diſtinguiſh the *manner* in which events depending upon *will* and *choice* are produced, from thoſe in which no volition is concerned, the former are ſaid to be produced *voluntarily*, and the latter *mechanically*. But the ſame general maxims apply to them both. We may not be able to determine *à priori* how a man will act in any particular caſe; but it is becauſe we are not particularly acquainted with his *diſpoſition of mind*, *preciſe ſituation*, and *views of things*. But neither can we tell in which way the wind will blow to-morrow, though the *air* is certainly ſubject to no other than neceſſary laws of motion.

"It is univerſally acknowledged, that there can be no effect without an adequate cauſe. This is even the foundation on which the only proper argument for the being of a God reſts. And the neceſſarian aſſerts, that if, in any given ſtate of mind, with reſpect both to *diſpoſition* and *motives*, two different determinations or volitions be poſſible, it can be ſo on no other principle, than that one of them ſhall come under the deſcription of an *effect without a cauſe*; juſt as if the beam of a balance might incline either way, though loaded with equal weights. It is acknowledged, that the mechaniſm of the balance is of one kind, and that of the mind of another: and, therefore, it may be convenient to denominate them by different words; as, for inſtance, that of the balance may be termed a *phyſical*, and that of the mind a *moral* mechaniſm. But ſtill, if there be a *real mechaniſm* in both caſes, ſo that there can be only one reſult, from the ſame previous circumſtances, there will be a *real neceſſity*, enforcing an abſolute certainty in the event. For it muſt be underſtood, that all that is ever meant by *neceſſity in a cauſe*, is that which produces *certainty in the effect*."

Such is the nature of human volitions, according to every neceſſarian of eminence who has written on the ſubject ſince the days of Hobbes: and if this theory be juſt, if there be a conſtant and inſeparable conjunction of motives and actions ſimilar to that of cauſe and effect in phyſics, it is obvious, that in volition the mind is as inert as body is in motion.

283 View of human liberty.

This conſequence is indeed avowed and inſiſted upon by Hume, Prieſtley, and their adherents; whilſt the advocates for human liberty, on the other hand, contend for an abſolute exemption of the will from all internal *neceſſity*, ariſing from its own frame and conſtitution, the impulſe of ſuperior beings, or the operations of objects, reaſons, or motives, &c. By this they do not mean, that between motives and volitions there is no relation whatever, or that a man can ever chooſe evil as evil, or refuſe good as good. Such an aſſertion would be contrary to conſciouſneſs and univerſal experience. But what they endeavour to prove is, that the conjunction of motive and volition is not inſeparable, like that of cauſe and effect in phyſics; that a man may in moſt caſes chooſe according to any one of two or more motives preſented to his view; that by chooſing any thing, he may make it in ſome meaſure agreeable by his own act, or, to ſpeak more properly, may bend his deſire to it; that in volition, the mind is not inert; and that, therefore, we are under no *neceſſity* to act in a particular manner in any given caſe whatever.

That the conjunction of motive and action is not conſtant like that of cauſe and effect in phyſics, and that by conſequence the mind in forming volitions is not inert, has been evinced by Dr Gregory with the force and preciſion of mathematical demonſtration.—Former writers on the ſide of liberty had often obſerved, that upon the ſuppoſition of the *inertia* of mind, a man, with equal and oppoſite motives preſented at once to his view, would, during their continuance, remain perfectly at reſt, like a balance equally loaded in both ſcales. The obſervation is admitted to be juſt by all the advocates for neceſſity; but they contrive to evade its conſequences, by denying that in any given caſe a man can be at once aſſailed by two equal and oppoſite motives. Thus, when it is ſaid that a porter, ſtanding with his face due north, muſt remain in that poſition at perfect reſt, as long as equal motives ſhall at once be offered to him for travelling eaſtward and weſtward, the neceſſarians admit the force of the argument; but when it is added that a guinea, offered for every mile that he ſhould travel in each of theſe oppoſite directions, ought therefore to fix him at reſt till one of the offers be withdrawn, they deny that the deſire of gaining the guineas is the *whole* of the motives which operate upon his mind. He may have, ſay they, ſome ſecret reaſon which we cannot diſcern for preferring the one direction to the other; and that reaſon, added to the guinea, will make him go eaſtward or weſtward, juſt as an ounce thrown into either ſcale of a balance poiſed by equal weights will make that ſcale preponderate. Though we think that this ſolution of the difficulty can ſatisfy no man who is not already biaſſed to the neceſſarian ſyſtem; and though, even were it to be admitted, it ſeems to militate againſt the conſtant conjunction of motives and actions, unleſs it can be proved that the porter muſt travel the road which he has been neceſſitated to chooſe with reluctance and a heavy heart; yet as it may admit of endleſs quibbling upon ambiguous words, the philoſophical world is much indebted to Dr Gregory ‡ for an argument which, in our opinion can neither be overturned nor evaded, and which demonſtrates that the conjunction of motive and action cannot be conſtant and inſeparable, like that of cauſe and effect in phyſics.

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* The Doctrine of philoſophical Neceſſity illuſtrated.

284 Demonſtration that the conjunction of motive and action is conſtant.

His reaſoning is to this purpoſe: Suppoſe a porter to be offered a guinea for every mile that he ſhall travel directly eaſtward If there be no phyſical cauſe or moral motive to keep him at reſt, or to induce him to move in another direction, there cannot be a doubt, upon either hypotheſis, but he will gladly embrace the propoſal, and travel in the direction pointed out to him, till he ſhall have gained as much money as to ſatisfy his moſt avaricious deſires. The ſame thing would have happened if a guinea had been offered for every mile that he ſhould travel due ſouth. In theſe two caſes taken ſeparately, the relation between the man's motives and his actions would be ſtrikingly analogous to that between a ſingle impulſe and motion in phyſics. Let us now ſuppoſe the two offers to be made at the ſame inſtant, and the man to be aſſured that if he travel eaſtward he can have no part of the reward promiſed for his travelling to the ſouth, and that if he travel ſouthward he can have no part of the reward promiſed for his travelling to the eaſt. What is he to do in this caſe? If his mind be inert in volition, and if the two motives operate upon him with the ſame neceſſity that cauſes operate in phyſics, it is obvious that the man could travel neither towards the eaſt nor towards the ſouth, but in a diagonal direction from north-weſt to ſouth-eaſt; and this he muſt do *willingly*, although perfectly ſatisfied that he could gain nothing by his journey. As this inference is contrary to fact and univerſal experience, the Doctor very juſtly concludes that the premiſes, from which it is deduced by mathematical reaſoning, muſt be falſe and abſurd; or, in other words, that the relation between motive and action cannot be that of conſtant conjunction, like the relation between cauſe and effect in phyſics.

He uſes many arguments of the ſame kind, and equally convincing, to prove the abſurdity of ſuppoſing the inertneſs of mind, and only an occaſional conjunction of motives and actions; but we forbear to quote them, both becauſe we wiſh his book to be read, and becauſe we think the ſingle argument which we have borrowed from him ſufficient to demoliſh the theory of Prieſtley and Hume, which reſts wholly upon the hypotheſis of the *conſtant* conjunction of motive and action.

But is it then not really true, that the external action is determined by the will, the will by deſire, and deſire by what is agreeable or diſagreeable? That the external action is univerſally determined by the will, is certainly true; but that the will is neceſſitated and univerſally determined by the deſire is as certainly falſe. If Potiphar's wife was handſome, and made her propoſal to Joſeph with any degree of female addreſs; and if his conſtitution was like that of other young men; there cannot be a doubt but that he felt a *deſire* to do what ſhe requeſted of him: yet we know that he *willed* to do otherwiſe, and in direct oppoſition to his *deſire* fled from the room. Perhaps it may be ſaid, that his volition to flee was the effect of a contrary and ſtronger *deſire* not to ſin againſt God; but this is confounding the reader, by calling two energies of mind, between which there is little or no ſimilarity, by the ſame name. He perceived, or knew, that to comply with his miſtreſs's requeſt would be to ſin againſt God; he knew that he ought not to ſin againſt God, and therefore he choſe or determined himſelf not to do it. We can eaſily conceive how the preſence, attitudes, and addreſs, of the lady might be agreeable to him, and excite deſire. There may very poſſibly be more than one of our readers, who during the courſe of their lives, have experienced ſomething of the ſame kind: but could abſtract truth be in the ſame way agreeable, ſo as to excite in his mind a *deſire* of virtue ſufficient to annihilate or baniſh the *deſire* of the woman? As well may it be ſaid that one ſenſation can annihilate another, that the beautiful colours of the rainbow can remove the ſenſation of ſtench from the mind of him who is plunged into the midſt of a dunghill, or that the ſmell of a roſe can make a man inſenſible to the pain of a ſtroke inflicted by a bludgeon. Senſitive deſire, and the perception of duty, are things ſo totally different, that to conſider them as operating againſt each other like different weights in the oppoſite ſcale of a balance, is as abſurd as to ſuppoſe that ſound can operate againſt colour, or colour againſt ſmell. A man may prefer ſound to colour, or colour to ſmell, and act accordingly; but the determination muſt be wholly his own, unleſs theſe two ſenſations be themſelves either agents or phyſical cauſes of the *ſame kind*, like the weights in the oppoſite ſcales of the balance.

285 Men do not always determine themſelves by the ſtrongeſt motive.

The advocates for liberty do not pretend, that in matters of importance a man ever acts without ſome motive or reaſon for his conduct. All that they inſiſt upon is, that between two or more motives of different kinds he has a liberty of choice, and that he does not always determine himſelf by that which he knows to be the greateſt. Without ſuch freedom, they think men might be often brought into ſituations where they could not act at all, and where inaction would at the ſame time be in the higheſt degree abſurd. Thus, were two bags of gold, containing each a thouſand or ten thouſand guineas, to be placed on the ſame table, before a man whoſe family is periſhing for want, and were the man to be told that he might take either of them, but not both, is it conceivable that he would be held in perpetual ſuſpence between the two? No; he would inſtantly and with alacrity take up one of them without feeling the leaſt regret for the want of the other. This action would, indeed, be the conſequence of a very powerful motive, the deſire to obtain honeſtly that wealth of which he and his family ſtood ſo much in need. That motive, however, being general, would draw him equally to both bags; and it remains with the neceſſarians to ſay by what elſe than a ſelf determining power he could take either the one or the other. When it is affirmed, that ſuch ſelf-determination would be an effect without a cauſe, the advocates for liberty cannot help thinking that their antagoniſts are guilty of advancing as an argument a *petitio principii*; for the affirmation is true, only if the mind in volition be inert, and the *inertia* of the mind is the ſole queſtion at iſſue. If the mind be not inert, it is plain, that in conſequence of a man's ſelf-determination, no effect would be produced without a ſufa ſufficient cauſe. At any rate, motives cannot be cauſes. In the proper ſenſe of the word, a cauſe is that which produces an effect; but the production of an effect requires active power; and power being a quality muſt be the quality of ſome being by whom it may be exerted. Power may be dormant, and therefore power without will produces no effect. Are motives, then, real beings, endowed with power and will? No; they are only views of things or mental conceptions, which in the ſtricteſt ſenſe of the word are paſſive; and between two motives the mind determines itſelf, without receiving an impulſe from either.

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‡ Eſſay on the Relation between Motive and Action.

Nor is it only between motives of equal force that men have the power of determining themſelves. Whoever believes in a future ſtate of rewards and puniſhments, and yet acts in a manner which he knows to be offenſive to Him who is to be the future and final judge, unqueſtionably prefers to the ſtrongeſt of all motives, another which even to himſelf appears to have comparatively but very little ſtrength. Whether there be men who occaſionally act in this manner, is a queſtion which can be decided only by an appeal to every one's conciouſneſs. That there are, we can have no doubt, for we never met with a ſingle individual, not biaſſed by ſyſtem, who was not ready to acknowledge, that during the courſe of his life he had done many things, which at the time of action he clearly perceived to be contrary to his true intereſt. Without a ſelf determining power in the mind, this could never be the caſe. Did motives operate with the neceſſity of phyſical cauſes, it is obvious that in every poſſible ſituation the ſtrongeſt muſt conſtantly prevail; and that he who in certain circumſtances had in time paſt done any particular thing, would on a return of the ſame circumſtances do the very ſame thing in every time future. Dr Prieſtley, indeed, wiſhes to perſuade his readers that this is actually the caſe. "In every determination of the mind (ſays he), or in caſes where volition and choice are concerned, all the previous circumſtances to be conſidered are the *ſtate of mind* (including *every thing belonging to the will itſelf)*, and the various views of things preſented to it;" and he affirms, that "whenever the ſame preciſe circumſtances occur twice, the very ſame determination or choice will certainly be made the ſecond time that was made the firſt." This is an aſſertion of which no man can controvert the truth; for it is an identical propoſition. If in the circumſtances previous to the determination of the mind, *every thing* belonging to the *will itſelf* muſt be included, it is ſelf-evident that he who in any given circumſtances has acted a particular part, will on a return of theſe circumſtances act the ſame part a ſecond time; for this is only ſaying, that he who on two different occaſions ſhall exert volitions of the ſame tendency, will not on theſe occaſions exert volitions of which the tendencies are different. But the queſtion to be decided is, Whether a man, in the ſame general ſtate of mind, poſſeſſed of the ſame degree of health, and conſcious of the ſame appetites, muſt, in external circumſtances perfectly alike, neceſſarily exert at all times the ſame volitions. That the human mind is under no ſuch neceſſity, we think every man's conſciouſneſs and experience may abundantly ſatisfy him; for there are, perhaps, but very few who have not at one time reſiſted temptations, to which at another they have choſen to yield.

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If they did, folly as well as merit and demerit would be baniſhed from the world.

That there is a relation between motives and actions, muſt be confeſſed; but that relation is neither *neceſſity*, nor conſtant conjunction. If it were, all actions would be perfectly rational; and folly, as well as merit and demerit, would be baniſhed from the conduct of men. What is the particular nature of that relation which ſubſiſts between the voluntary actions of men, and the motive from which they proceed, can be known to every individual only by an attentive and unbiaſſed reflection on the operations of his own mind. Without this reflection, no man can be made to underſtand it by the reaſonings of philoſophers, and with it no man can need the aid of thoſe reaſonings. That a ſelf-determining power, ſuch as that for which we plead, contributes to the ſum of human happineſs, has been ſhown by Archbiſhop King and his ingenious tranſlator; who have proved, with the force of demonſtration, that the mind can take pleaſure in the object of its choice, though that object be in itſelf neither agreeable nor diſagreeable to our natural appetites; and that if it could not, it would be vain in ſuch a world as ours to hope for any portion of felicity. Into that detail our limits will not permit us to enter: but to the reader who wiſhes for further information, we beg leave to recommend the laſt edition of King's Origin of Evil, by Dr Law late biſhop of Carliſle; without, however, vouching for the truth of all the opinions advanced by either of thoſe learned writers.

Before we conclude this chapter, it may be proper to obſerve, that it is only in volition that we are conſcious of any original active power in ourſelves, and that without ſuch conſciouſneſs we could never have acquired the *notion* of active power. In our deſires and appetites, we neither are active nor ſuppoſe ourſelves active. Lord Kames, and moſt neceſſarians, confound deſire with volition: but that they are perfectly diſtinct is plain from this circumſtance, that we daily *deſire* many things which we know to be wholly *out* of our own power*, whereas no man ever *willed* what he did not believe to be *in* his own power. We all *deſire* or wiſh that our children may be virtuous, wiſe, and happy; and though we are conſcious that it is not in our power to make them ſo, we cannot baniſh the deſire from our breaſts. But madmen only have ever *willed* virtue, wiſdom, and happineſs, to any perſon; and if there was ever a man ſo extravagantly mad as to exert ſuch a volition as this, he has at the time fancied himſelf a divinity, and therefore believed that the object of his volition depended upon himſelf. When the aſtronomer, whoſe character is ſo admirably drawn by our great maſter of moral wiſdom †, fancied himſelf the regulator of the weather and the diſtributor of the ſeaſons he might *will* either *rain* or *ſunſhine* as he thought proper, becauſe he conſidered the object of his volition as depending upon a power imparted to him from heaven; but though he might *deſire*, he could not *will*, the riſing or the falling of *winds*, for theſe he confeſſed were not ſubjected to his authority. In a word, without freedom in volition, power is inconceivable; and therefore it is as certain that we are free agents as that we have any notion of active powers.

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* Reid's Eſſays on the active powers, &c.

† Raſſelas Prince of Abyſſinia.

CHAP. VI. *Of the* BEING *and* ATTRIBUTES *of* GOD.

IT has been already obſerved, that as of bodies there are various kinds, endowed with various properties; ſo the probability is, that of minds endowed with different powers, or different degrees of power, the variety may be as great, or perhaps greater. The exiſtence and powers of our own minds are made known to us by conſciouſneſs and reflection; and from our dependent ſtate, and the mutability of the objects around us, we are neceſſarily led to infer the exiſtence of another mind, which is independent, unchangeable, eternal, and the cauſe of all things which have a beginning of exiſtence. Between that mind and our own, we can hardly avoid believing that there are many orders of "thrones, dominations, princedoms, virtues, powers;" but as we have no intuitive knowledge of ſuch intermediate beings, and cannot from any thing which we perceive diſcern the *neceſſity* of their exiſtence, they are not properly the object of ſcience. The exiſtence, however and many of the attributes of One Firſt Cauſe, are capable of the ſtricteſt demonſtration; "for the inviſible things of Him from the creation of the world are clearly ſeen, being underſtood by the things which are made."

287 The exiſtence of God capable of demonſtration.

Of this great truth, the moſt important by far which can occupy the mind of man, many demonſtrations have been given both by divines and by philoſophers. We ſhall lay before our readers ſuch a one as to us appears perfectly concluſive, being founded on the intuitive knowledge which we have of our own exiſtence, and therefore independent of all theories about the nature and reality of the material world.

Every man, whether he adopt the common theory or that of Berkeley reſpecting matter, is conſcious that he *himſelf* exiſts, and muſt therefore grant that *ſomething now* exiſts. But if any thing exiſt *now* *, then muſt ſomething have *always* exiſted; otherwiſe that thing which *now* exiſts, muſt either have been created by *nothing*, i. e. have been *cauſed by no cauſe*, or elſe it muſt have *created itſelf*, acting before it exiſted. Both theſe ſuppoſitions are ſo palpably abſurd, that no atheiſt has avowed them, either among the ancients or the moderns. We muſt therefore admit, either that there is ſome one *independent* being, which now exiſts, and always has exiſted; or that the things which we know to exiſt at preſent (every man's *ſelf* for inſtance), were produced by *ſomething* which had its *exiſtence* from *ſomething elſe*, which alſo depended upon *ſome other cauſe*, and ſo on in an *infinite ſeries of cauſed* or *ſucceſſive beings*. But this laſt ſuppoſition, though it has been often made, is as groſsly abſurd as either of the two former. For of this infinite ſeries, either *ſome one* part has *not* been ſucceſſive to any other, or elſe *all* the ſeveral parts of it have been ſucceſſive. If ſome one part of it was *not ſucceſſive*, then it had a *firſt part*; which deſtroys the ſuppoſition of its infinity (R). If *all* the ſeveral parts of it have been ſucceſſive, then have they all once been *future*; but if they have *all* been future, a time may be conceived when none of them had exiſtence: and if ſo, then it follows, either that all the *parts*, and conſequently the *whole* of this infinite ſeries, muſt have ariſen from *nothing*, which is abſurd; or elſe that there muſt be ſomething in the *whole* beſides what is contained in *all the parts*, which is alſo abſurd.

288 Some one independent Being has exiſted from eternity.

As the poſſibility or impoſſibility of an infinite ſeries of dependent beings is the main queſtion at iſſue between the atheiſts and us, we ſhall ſtate the preceding reaſoning in a manner ſomewhat different. For this purpoſe, let us ſuppoſe ſome one to affirm, that the courſe of generation has had no beginning, and conſequently that the number of ſucceſſive births has been infinite. We would aſk ſuch a perſon, Whether before the birth of Abraham, for example §, there had paſt an infinite ſeries of generations or not? If not, the courſe of generation muſt have had a beginning, which is the concluſion for which we contend. But if the ſeries paſt was infinite, then at the birth of Joſeph the great-grandſon of Abraham, it is evident, that more generations were paſt, and that the number then was greater than that which was ſuppoſed to be infinite; ſo that upon this ſuppoſition we have a number that is both infinite and not infinite, which is a manifeſt contradiction. Should it be ſaid that the number of generations was infinite, as well at the birth of Abraham as at the birth of Joſeph; it will then follow, that one infinite may be greater than another of the very ſame kind; and conſequently that an infinite may be bounded, *i. e.* be finite. But ſhould it be alledged, that the number of births at Abraham's was finite, and became infinite when it reached to Joſeph's, it will then follow, that one finite number added to another may make an infinite number, which is directly contrary to every poſſible notion of infinity. We might argue in the ſame manner againſt an infinite ſeries of every kind, the very ſuppoſition of which involves the moſt palpable contradictions. See Chap. *Of* INFINITY *and* ETERNITY.

289 Whoſe duration is not commenſurate with ſucceſſion, and

From the impoſſibility of an infinite ſeries it neceſſarily follows, that there exiſts, and muſt have exiſted from eternity, ſome one independent being, whoſe duration cannot be commenſurate with ſucceſſion, and to whom the relation of time is not applicable. Here will ſome atheiſts preſently imagine, that by the ſame mode of reaſoning they may diſprove the exiſtence of God: for do not they who thus deſtroy the eternity of the world, deſtroy at the ſame time the eternity of the Creator? If time itſelf be not eternal, how can the Deity or any thing elſe be ſo?

In urging theſe queſtions, it muſt be taken for granted that time is eſſential to all exiſtence, and that God cannot be eternal otherwiſe than by a ſucceſſive flux of infinite time. But it has been already ſhown (n° 225), that ſucceſſive duration is not eſſential to exiſtence; that we can even *conceive* exiſtence without ſucceſſion; and it may here be added, that if we ſuppoſe a perfect being alone in nature, we ſhall find it impoſſible to imagine any *ſucceſſion of ideas*, any *flux of moments*, or any *alteration* or *increaſe* whatever in his knowledge and eſſence.

* See Notes to King's Origin of Evil.

§ See an Eſſay towards an Eviction of the Being and Attributes of God by Seth Ward—Printed at Oxford, 1654.

(R) Των απειρων ουκ εϛιν ουδεν πρωτον. *Ariſt. Phyſ.* lib. viii. cap. 5. ſect. 4.

eſſence. Such duration as we are acquainted with can have no relation to an immutable Being, while ſuppoſed to exiſt alone; but as ſoon as he determined to exerciſe his ſeveral attributes in the production of ſomething diſtinct from himſelf, then, and not till then, have we reaſon to think that *time*, *ſucceſſion*, and *increaſe*, began. Theſe atheiſtical queſtions, therefore, inſtead of containing an objection to the exiſtence of a Deity, afford a plain demonſtration of it: for ſince it is not more evident that ſomething now exiſts than that ſomething muſt have exiſted from eternity; and ſince it has been ſhewn that neither the world in its preſent ſtate, nor time, nor any thing capable of change nor ſucceſſion, can poſſibly be eternal; it follows, that there muſt neceſſarily be ſome Being who, in the order of nature, is before time, and who, in the ſtability and immutable perfection of his own intelligence, comprehends at once his *yeſterday*, *to-day* and *forever*. "The atheiſts (ſays the excellent Cudworth [*]) can here only ſmile, or make wry faces, and ſhow their little wit in quibbling upon *nunc-ſtans*, or a *ſtanding now of eternity*; as if that *ſtanding eternity* of the *Deity* (which with ſo much reaſon has been contended for by the ancient *genuine theiſts*(were nothing but a *pitiful ſmall moment of time ſtanding ſtill*, and as if the duration of all beings whatſoever muſt needs be like our own: whereas the duration of every thing muſt of neceſſity be agreeable to its nature; and therefore, as that whoſe *imperfect nature* is ever *flowing* like a river, and conſiſts in *continual motion* and *changes* one after another, muſt needs have accordingly a *ſucceſſive* and *flowing duration*, ſliding perpetually from *preſent* into *paſt*, and always haſting on towards the *future*, expecting ſomething of itſelf which is not yet in being; ſo muſt that whoſe perfect nature is *eſſentially immutable* have *permanent and unchanging duration*, never loſing any thing of itſelf once preſent, nor yet running forward to meet ſomething of itſelf which is yet not in being."

290 who is ſelf-exiſtent, and

From the eternity of the ſupreme Being we neceſſarily infer his dependence on ſelf-exiſtence; for that which never had a *beginning* of exiſtence cannot poſſibly have any cauſe of that exiſtence, or in any manner depend upon any other being, but muſt exiſt of itſelf, or be *ſelf-exiſtent*.

291 cannot ceaſe to be.

Eternity *ad partem poſt*, or *neceſſary exiſtence*, or the impoſſibility of ever ceaſing to be, follows from independence: For to the nature of that which exiſts without any cauſe, exiſtence muſt be eſſential. But a being whoſe exiſtence is of itſelf and eſſential to its nature, cannot be *indifferent* to exiſtence or non-exiſtence, but muſt exiſt *neceſſarily*. And here it may be proper to obſerve, that the word *neceſſity*, when applied to exiſtence, may be taken in two acceptations very different from each other [†]; either as it ariſes from the relation which the exiſtence of that thing, of which it is affirmed, has to the exiſtence of *other things*; or from the relation which the *actual* exiſtence of that thing has to the *manner* of its *own* exiſtence.

292 What is meant by neceſſary exiſtence.

In the former ſenſe, when neceſſity of exiſtence has relation to the exiſtence of other things, it denotes that the ſuppoſition of the *non*-exiſtence of that thing of which neceſſity is affirmed, implies the non-exiſtence of things which we *know to exiſt*. Thus, ſome independent being does *neceſſarily exiſt*; becauſe, to ſuppoſe *no independent* being, implies that there are *no dependent beings*; the contrary of which we know to be true.

In the ſecond ſenſe, when the neceſſity of his exiſtence ariſes from the relation which the actual exiſtence of any thing has to the *manner* of its own exiſtence, neceſſity means, that the thing, of which it is affirmed, exiſts after ſuch a manner as that it never could in *time paſt* have *been non-exiſtent*, or can in *time future ceaſe to be*. Thus, *every independent being*, as it exiſts without a cauſe, is *neceſſarily* exiſting; becauſe exiſtence is *eſſential* to ſuch a being; ſo that it never could *begin* to exiſt, and never can *ceaſe to be*: For to ſuppoſe a being to begin to exiſt, or to loſe its exiſtence, is to ſuppoſe a *change* from non-entity to entity, or *vice verſa*; and to ſuppoſe ſuch a change is to ſuppoſe a cauſe upon which that being depends. Every being, therefore, which is independent, *i. e.* which had no cauſe of exiſtence, muſt exiſt *neceſſarily*, and cannot poſſibly have begun to exiſt in time paſt, or ceaſe to be in time future.

293 Only one neceſſarily-exiſtent being in the former ſenſe; and

Theſe two kinds of neceſſity as applied to exiſtence, though they have been often confounded, are in themſelves perfectly diſtinct: For though a being cannot be neceſſarily exiſtent in the *former* ſenſe without being ſo in the latter alſo; yet it may be neceſſarily exiſtent in the latter ſenſe without being ſo in the former. For any thing that we know to the contrary, there may be two or more beings exiſting *neceſſarily* in the latter ſenſe of the word *neceſſity*, i. e. with regard to *independence* and the *manner* of their own exiſtence: but in the former ſenſe of the word, *i. e.* in relation to *this ſyſtem*, there can be but *one neceſſarily* exiſtent being; for it is obvious that no more are neceſſary to account for the production of the *dependent* beings which we know to exiſt. To ſuppoſe the non-exiſtence of *all independent* beings, implies the non-exiſtence of all dependent beings, ourſelves and every thing elſe; but to ſuppoſe the non-exiſtence of all independent being except *one*, involves in the ſuppoſition no ſuch abſurdity.

294 though there might be more than one in the latter, they would be no gods to us.

Thus the phenomena of nature leads us, by the ſtricteſt reaſoning, to one firſt cauſe, which is ſufficient for the production; and therefore none but *one* firſt cauſe can in this ſenſe of the word be *neceſſary*: And though ſeveral mere *independent* beings might poſſibly exiſt, yet they would be no gods to us; they would have no relation to us demonſtrable by reaſon, nor we any thing to do with them. For if the ſuppoſition of their exiſtence were not requiſite to the production of this ſyſtem, which it obviouſly would not be, we could *perceive* no neceſſity for it at all; we could never diſcover it by our own faculties, and therefore it could be nothing to us. And tho' two or three ſuch beings ſhould exiſt, and act in the formation and government of their *reſpective* ſyſtems, or *agree in one*; yet till their exiſtence and operations were made known to us, and a natural relation diſcovered, nothing would be due from us to them. They would have no *religious* or *moral* relations to us; and we ſhould have no reaſon to call more than one of them *our* creator, preſerver, and governor, which is the proper ſenſe of the word *God*.

To ſhew in this manner that there is only *one* eternal ſelf-exiſtent Being which bears the relation of *God to us*, ſeems to be going as far as is neceſſary, or as natural

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[*] Intellectual Syſtem, Book 1. chap. 5.

[†] Notes to King on Evil, and Law's Inquiry into the Ideas of Space, &c.

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Impoſſible to demonſtrate that there can be but one ſelf-exiſtent Being.

tural light will lead us. Thoſe who endeavour to *demonſtrate* that there *cannot poſſibly* be *more than one* ſelf-exiſtent Being, either reaſon in a circle, or proceed upon principles which their antagoniſts cannot be compelled to grant. When they deduce the Divine unity from independence or omnipotence, they evidently preſuppoſe it in their definition of theſe attributes: and when they infer it from the nature of ſpace and duration, which they conſider as modes of the ſelf-exiſtent Being, they take it for granted, that ſpace and duration have a real exiſtence, independent of us and our thoughts; and that the one is infinite and the other eternal, contrary to what has been already proved, we think, with the force of demonſtration. The celebrated Dr Clarke made much uſe of ſpace and duration in his attempt to demonſtrate that there can be but one ſelf-exiſtent Being; but he argues for the ſame thing from the nature of neceſſity as applied to exiſtence.

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Dr Clarke's firſt demonſtration of the unity

"Neceſſity (ſays he*), abſolute in itſelf, is *ſimple* and *uniform* and *univerſal*, without any poſſible *difference*, *difformity*, or *variety*, whatſoever: and all *variety* or *difference* of *exiſtence* muſt needs ariſe from ſome *external* cauſe, and be *dependent upon it*, and *proportionable* to the efficiency of that *cauſe*, whatſoever it be. *Abſolute neceſſity*, in which there can be *no variation* in *any kind* or *degree*, cannot be the *ground* of exiſtence of a *number* of Beings, however *ſimilar* and *agreeing*: becauſe, without any *other difference*, even *number* is itſelf a manifeſt *difformity* or *inequality* (if I may ſo ſpeak) of *efficiency* or *caſuality*."

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examined, and ſhown to be inconcluſive.

Such is this great man's firſt argument from neceſſity, to prove that there cannot be more than one ſelf-exiſtent Being. But what is this *neceſſity* which proves ſo much? It is the ground of exiſtence (he ſays) of that which exiſts of itſelf; and if ſo, it muſt, in the order of nature, and in our conceptions, be antecedent to that being of whoſe exiſtence it is the ground. Concerning ſuch *a* principle, there are but three ſuppoſitions which can poſſibly be made; and all of them may be ſhown to be abſurd and contradictory. We may ſuppoſe either the *ſubſtance* itſelf, ſome *property* of that ſubſtance, or ſomething *extrinſic* to both, to be this *antecedent ground* of exiſtence prior in the order of nature to *the firſt cauſe*.

One would think, from the turn of the argument which here repreſents this antecedent neceſſity as *efficient* and *cauſal*, that it were conſidered as ſomething *extrinſic* to the firſt cauſe *. Indeed if the words have any meaning in them at all, or any *force* of argument, they muſt be ſo underſtood, juſt as we underſtand them of any external cauſe producing its effect. But as an *extrinſic* principle is abſurd itſelf, and is beſides rejected by Dr Clarke, who ſays expreſsly, that "of the thing which derives not its being from any other thing, this *neceſſity* or ground of exiſtence muſt be *in* the thing itſelf," we need not ſay a word more of the laſt of theſe ſuppoſitions.

Let us then conſider the firſt; let us take the *ſubſtance* itſelf, and try whether *it* can be conceived as *prior* or *antecedent* to itſelf in our conceptions or in the order of nature. Surely we need not obſerve that nothing can be more abſurd or contradictory than ſuch a ſuppoſition. Dr Clarke himſelf repeatedly affirms, and it would be ſtrange indeed if he did not affirm, that no *being*, no *thing* whatever, can be conceived as in any reſpect prior to the firſt cauſe.

The only remaining ſuppoſition is, that ſome *attribute* or *property* of the ſelf-exiſtent Being may be conceived as in the order of nature *antecedent* to that being. But this, if poſſible, is more abſurd than either of the two preceding ſuppoſitions. An *attribute* is *attributed* to its *ſubject* as its ground or ſupport, and *not* the *ſubject* to its *attribute*. A *property*, in the very notion of it, is *proper* to the ſubſtance to which it belongs, and *ſubſequent* to it both in our conceptions and in the order of nature. An *antecedent* attribute, or *antecedent* property, is a ſoleciſm as great, and a contradiction as flat, as an *antecedent ſubſequent* or *ſubſequent antecedent*, underſtood in the ſame ſenſe and in the ſame ſyllogiſm. Every property or attribute, as ſuch, preſuppoſes its ſubject; and cannot otherwiſe be underſtood. This is a truth ſo obvious and ſo forcible, that it ſometimes extorts the aſſent even of thoſe who upon other occaſions labour to obſcure it. It is confeſſed by Dr Clarke ‡, that "the ſcholaſtic way of proving the *exiſtence* of the ſelf-exiſtent Being from the abſolute perfection of his nature, is υστερον προτερον. For all or any perfections (ſays he) preſuppoſe exiſtence; which is a *petitio principii*." If therefore properties, modes, or attributes in God, be conſidered as perfections (and it is impoſſible to conſider them as any thing elſe), then, by this confeſſion of the great author himſelf, they muſt all or any of them *preſuppoſe* exiſtence. It is indeed immediately added in the ſame place, "that bare neceſſity of exiſtence does not preſuppoſe, but infer exiſtence;" which is true only if ſuch neceſſity be ſuppoſed to be a principle *extrinſic*, the abſurdity of which has been already ſhown, and is indeed univerſally confeſſed. If it be a *mode* or *property*, it muſt *preſuppoſe* the exiſtence of its ſubject, as certainly and as evidently as it is a *mode* or a *property*. It might perhaps *à poſteriori* infer the exiſtence of its ſubject, as effects may infer a cauſe; but that it ſhould infer in the other way *à priori* is altogether as impoſſible as that a *triangle* ſhould be a *ſquare*, or a *globe* a *parallelogram*.

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A ſecond demonſtration of the ſame author

Doubtful, as it would ſeem, of the force of his firſt argument, which even thoſe who pretend to be convinced by it acknowledge to be obſcure, the Doctor gives a ſecond, which we muſt confeſs appears to us to be ſtill more obſcure, and if poſſible leſs concluſive. "To ſuppoſe two or more *diſtinct beings* exiſting *of themſelves* neceſſarily and *independent* of each other, implies (he ſays) this *contradiction*, that *each* of them being independent from the other, they may either of them be ſuppoſed to exiſt *alone*; ſo that it will be no contradiction to ſuppoſe the other not to exiſt; and conſequently *neither of them* will be neceſſarily exiſting. Whatſoever therefore exiſts neceſſarily is the one ſimple eſſence of the ſelf exiſtent Being; and whatſoever differs from that is not neceſſarily exiſting, becauſe in abſolute neceſſity there can be no *difference* or *diverſity* of exiſtence.

"Neceſſity is uſed here in two different ſenſes †, both as *abſolute* and *relative*. In the former, neither of the two beings can exiſt without the other, *i. e.* without our ſuppoſing the other to exiſt alſo, ſince that is equally neceſſary. In the latter, either of them may exiſt alone, *i. e.* without the help of the other, or without the ſuppoſition of the other as requiſite to its own

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* Demonſtration of the Being and Attributes of God, Prop. 7.

* Diſſertation on the Argument à priori, added to Law's Inquiry into the Ideas of Space, Time, Immenſity, &c.

‡ Anſwer to the ſixth Letter.

† Law's Inquiry into the ideas of Space, &c. chap. 6.

299 examined and ſhown to be equally inconcluſive.

exiſtence. The conſequence therefore that either of them may exiſt alone, and ſo neither of them is neceſſary, is a mere *equivocation* on *neceſſity*, uſing it both in an abſolute and relative ſenſe at the ſame time." But as this is a queſtion of the higheſt importance, and as the author was a man of great worth, we ſhall conſider his argument upon the ſuppoſition that the word *neceſſity* has from the beginning to the end of it the ſame invariable meaning.

It has been already obſerved, that there are only two ſenſes in which that word can be applied to the exiſtence of any being; and whether it be here uſed in the one or the other of theſe ſenſes, the reaſoning, if reſolved into a ſyllogiſm, will appear to be inconcluſive. If the word be taken in that ſenſe of neceſſity which ariſes from the relation that dependent beings which we know to exiſt bear to ſome one independent Being, the argument will ſtand thus:

From a known effect no more cauſes can be *neceſſarily* inferred than what are ſufficient to account for that effect: but

One ſelf-exiſtent and independent Being is ſufficient to account for all the phenomena of nature; therefore, from the phenomena, &c.

No more than *one* ſuch Being can be *neceſſarily* inferred to exiſt.

But though no more than *one* independent being can in this ſenſe of the word *neceſſarily* exiſt, it by no means follows from this ſyllogiſm, that two or more ſuch beings may not *poſſibly* exiſt. It is, indeed, a plain contradiction to ſay, that two or more ſelf-exiſtent beings are in this ſenſe *neceſſary*; but ſurely there is no contradiction in ſaying, that two or twenty ſuch beings are *poſſible*. We could not, therefore, by this argument, convict a perſon of abſurdity, who ſhould affirm that two or more independent beings *actually* exiſt. We might, indeed, deny the exiſtence of them all but *one*, becauſe one is ſufficient to account for thoſe phenomena, from which alone we know that *any* independent being exiſts; but becauſe one of them might be ſuppoſed to exiſt *alone*, ſo that it would be no contradiction to ſuppoſe the other not to exiſt; we know not how the Doctor came to affirm, in direct oppoſition to his own demonſtration, that *not one* of them would be neceſſarily exiſting.

Neceſſity, as applied to exiſtence, in the other ſenſe of the word, ariſes, as we have ſeen, from the relation which the *actual* exiſtence of the being, of which it may be affirmed, has to the *manner* of that being's exiſtence. It is the ſame neceſſity, we are told *, with that which is the *cauſe* of the unalterable proportion between two and four; and it is conſidered as the *formal* cauſe or *ground* of the exiſtence of an independent being. Were it not for the ſtrange expreſſions *formal cauſe* and *ground of exiſtence*, we ſhould have no objection to this account of that *neceſſity* by which a being independent undoubtedly exiſts: but this kind of neceſſity is a principle which will not ſupport the ſuperſtructure which the learned author labours to raiſe upon it. The ſame *neceſſity* which is the cauſe of the unalterable proportion betwen *two* and *four*, is likewiſe the cauſe of the unalterable proportion between *three* and *ſix*; between *four* and *eight* and between *five* and *ten*, &c. But if it can be the cauſe of ſo many different proportions of the ſame kind, why may it not be the *formal cauſe* or *ground* of exiſtence to as *many independent beings* of the ſame kind as well as to *one*? The following ſyllogiſm, we apprehend, to be legitimate both in mode and figure, and its concluſion is directly contrary to the propoſition which the Doctor deduces from the ſame notion of neceſſity.

If neceſſity, conſidered as a *formal cauſe* or *ground* of *exiſtence*, be in *one inſtance* of its cauſality the formal cauſe or ground of exiſtence to *many things* of the ſame kind, it *may* likewiſe in *every other inſtance* of its cauſality, be the formal cauſe or ground of exiſtence to many things of the ſame kind.

But ſuch neceſſity, in that inſtance of its cauſality where it is the formal cauſe or ground of exiſtence to the unalterable proportion between two and four, *is* the formal cauſe or ground of exiſtence to *many proportions* of the ſame kind.

Therefore, the ſame neceſſity in that other inſtance of its cauſality, where it is ſaid to be the formal cauſe or ground of exiſtence to *one* independent being, undoubtedly *may be* the formal cauſe or ground of exiſtence to *many independent beings* of the ſame kind.

300 Neceſſity, a dangerous principle.

Thus it appears, that *neceſſity*, in any ſenſe in which it can be properly affirmed of exiſtence, cannot be the foundation of any argument to prove the impoſſibility of more than one ſelf-exiſtent being. It is indeed a principle from which we apprehend that no poſitive concluſion whatever can be deduced by reaſoning *à priori*. That neceſſity of exiſtence may be predicated of a being which is independent and uncreated, is ſelf-evident; becauſe to the *nature* of ſuch a being exiſtence is eſſential. But whilſt *that nature* itſelf remains wholly *incomprehenſible* by us, it is impoſſible that we ſhould diſcover, by our own unaſſiſted reaſon, whether it can be the nature of *only one*, or of *more than one* independent being. To argue from neceſſity, as if it were the cauſe or ground of exiſtence to ſuch a being, is certainly abſurd, if it be not impious; for if that to which exiſtence is eſſential, does not exiſt without any cauſe efficient or formal, we ſhall be obliged to inquire after a cauſe or ground of this cauſe, and thus be involved in all the abſurdities and contradictions of an infinite ſeries. We have inſiſted the longer on this point, becauſe *neceſſity*, as the foundation of the argument *à priori*, has ſometimes been employed to very bad purpoſes. Attempts have been made from the notion of *neceſſary* exiſtence, to prove that the Supreme Being cannot be a free agent, and to ſet the firſt principles of the religion of nature at variance with thoſe which are revealed in the ſcriptures.

301 The unity of God highly probable.

But though we are firmly perſuaded that the divine unity cannot be *demonſtrated à priori*, we are far from thinking it incapable of any *proof*. On the contrary, the common arguments *à poſteriori* drawn from the *order* and *harmony* of the world, have always ſatisfied us, and in our opinion muſt ſatisfy every perſon capable of proportioning his aſſent to evidence, that the Creator and Preſerver of ſuch a ſyſtem has but *one will* and *one intelligence*, and therefore is himſelf but *one being*. But *proof* is one thing; and *demonſtration* is, in the proper ſenſe of the word, another.

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* Anſwer to the Sixth Letter, from a Gentleman in Glouceſterſhire.

Of the Being and Attributes of God.

ther (G). And if we cannot arrive at *abſolute* certainty concerning this important truth by the light of nature, we ought to be the more thankful for that revelation, which has put the unity of God paſt diſputes to all who believe the holy ſcriptures.

302 God omnipotent.

The being which is ſelf-exiſtent and independent muſt be alſo *omnipotent.* That ſuch a being has *active power in ſome degree*, is ſhown at the ſame time and by the ſame medium that we prove his exiſtence; and ſince he depends upon no cauſe for his exiſtence or his power, he cannot depend upon any for the exertion of that power, and conſequently no *limits* can be applied to it. Limitation is an *effect* of ſome *ſuperior cauſe*, which in the preſent inſtance there cannot be: conſequently to ſuppoſe *limits* where there can be no *limiter*, is to ſuppoſe an *effect* without a *cauſe*. For a being to be *limited* or *deficient* in any reſpect †, is to be *dependent* in that reſpect on ſome *other* being which gave it juſt ſo much and no more; conſequently that being which in *no reſpect* depends upon any other is in *no reſpect* limited or deficient. In all beings capable of increaſe or diminution, and conſequently incapable of *perfection* or *abſolute infinity*, *limitation* or *defect* is indeed a neceſſary conſequence of exiſtence, and is only a *negation* of that perfection which is wholly incompatible with their nature; and therefore in theſe beings it requires no further cauſe. But in a being *naturally capable* of *perfection* or abſolute *infinity*, all *imperfection* or *finiteneſs*, as it cannot flow from the *nature* of that being, ſeems to require ſome *ground* or *reaſon*; which reaſon, as it is foreign from the being itſelf, muſt be the effect of ſome other external cauſe, and conſequently cannot have place in the *firſt cauſe*. That the ſelf-exiſtent being is *capable* of perfection or abſolute infinity muſt be granted, becauſe he is manifeſtly the ſubject of one infinite or perfect attribute, viz. *eternity*, or abſolute invariable exiſtence. In this reſpect his exiſtence has been ſhown to be perfect, and therefore it *may* be perfect in every other reſpect alſo. Now that which is the ſubject of one infinite attribute or perfection, muſt have all its attributes infinitely or in perfection; ſince to have any perfections in a finite limited manner, when the ſubject and theſe perfections are both *capable* of ſtrict *infinity*, would be the forementioned abſurdity of poſitive limitation without a cauſe. To ſuppoſe this eternal and independent being limited *in* or *by* its own *nature*, is to ſuppoſe ſome *antecedent nature* or *limiting quality* ſuperior to that being, to the exiſtence of which no *thing* no *quality*, is in any reſpect *antecedent* or *ſuperior*. And to ſuppoſe that there is no ſuch thing as *active power* in a being which is evidently the fountain of all power, is the groſſeſt of all abſurdities. The ſame method of reaſoning will prove knowledge and every other perfection to be *infinite* in the Deity, when once we have proved that perfection to belong to him at all; at leaſt it will ſhow, that to ſuppoſe it limited is unreaſonable, ſince we can find no manner of *ground* for limitation in any reſpect; and this is as far as we need go, or perhaps as natural light will lead us.

† Notes to King on Evil.

303 Omnipotence can do every thing which does not imply a contradiction.

Of the omnipotence of the ſupreme Being ſome philoſophers, as well theiſts as atheiſts, have talked very abſurdly. *Hobbes* ||, with a view to make this attribute appear impoſſible and ridiculous, affirms "that God by his omnipotence or infinite power could turn a tree into a ſylogiſm." And *Des Cartes* *, though certainly no atheiſt, childiſhly aſſerts, that all things whatever, even abſtract truth and falſehood, do ſo depend upon the arbitrary will and power of God, as that if he had pleaſed "twice two ſhould not have been four, nor the three angles of a plain triangle equal to two right ones." But the true notion of Omnipotence, ſo far from implying a power to turn a tree into a ſyllogiſm, or to make twice two not equal to four, implies only that the being poſſeſſed of it can actually perform whatever can be conceived by the moſt perfect underſtanding; conception in this caſe being the meaſure of poſſibility. Now every thing may be conceived by a mind ſufficiently enlarged which does not involve in it a direct contradiction; but what we clearly diſcern to imply a contradiction, ſuch as that a thing may be and not be at the ſame inſtant, cannot be conceived by any intellect, or made to exiſt by any power. And thus has this attribute of the Divinity been always ſtated, not only by the wiſer Chriſtians, but alſo by moſt of the ancient philoſophers themſelves, who expreſsly admit that "nothing is exempted from the divine power, but only to make that which hath been done to be undone." (H)

|| Leviath. chap. 3.

* Reſponſ. ad Objectiones Sextas, § 6.

And here it may be aſked, Whether creation, in the

(G) John Gerhard and John Voſſius both cite *Gabriel Biel* as acknowledging the unity of God to be incapable of rigid demonſtration; and with the ſentiments of that ſchoolman, thoſe two learned divines profeſs their own to agree.

Sed Biel (1. Sant. Diſt. 2. Q. 10. Art. 3.), ſtatuit "quod tantum *unum* eſſe Deum, ſit *creditum* et *non-demonſtratum* ratione naturali nobis in via poſſibili." Id nos ita interpretamur; etiamſi ex *naturæ libro* rationes *non contemnendæ* pro *unitate* divinæ eſſentiæ aſſerenda erui poſſint, eas tamen ad fidei πληροφοριαν cordibus noſtris ingenerandam, non ſatis efficaces eſſe. Ergo mens prius confirmanda eſt ex *verbo Dei*, et illuſtribus teſtimoniis in quibus ſe Deus generi humano patefecit: Poſtea utiliter poteſt addi conſideratio philoſophicarum demonſtrationum. *Gerhard. Loc. Comm. Tom. I.* p. 106.

Diſſentit *Gabriel Biel*, qui ante annos hoſce 140 *Tubingenſi* Gymnaſio præfuit. Is cenſet *probabiles* magis rationes eſſe quam *evidentes* et *certas.*—Verum eſto ſane, ut ſolæ non ſint αποδεικτικαι: At magnum iis pondus addit *traditio* vetus; tum autem quod argumenta iſthæc, ſi non prorſus αποδεικτικα, ſaltem uſque adeo *probabilia* ſint, ut της πολυθειας patroni nihil ullius momenti adferre valeant; cur pluſquam unum ſtatuere deum potius conveniat. *Voſſ. de Idolatria, Lib.* 1. *c.* 2.

(H) το δε γεγονος ουκ ενδεχεται μη γενεσθαι· διο αγαθως Αγαθων.
Μονου γαρ αὐτου και θεος στερισκεται,
Αγενητα ποιειν, ἁσσ αν ᾖ πεπραγμενα. *Ariſt. ad Nichomach.* lib. 6. cap. 2.

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Creation poſſible to Omnipotence.

the proper ſenſe of the word (ſee Creation), be within the compaſs of infinite power. All the ancient philoſophers, who were uninlightened by the rays of divine revelation, held that it is not †; grounding their opinion upon this maxim, *Ex nihilo nihil fit.* But the maxim will ſupport no ſuch concluſion.—The ancients, or at leaſt the Peripatetic ſchool, with the metaphyſics of which we are beſt acquainted, conſidered four kinds of cauſes, the *efficient*, the *material*, the *formal*, and the *final*; and though they extended the maxim to the firſt *two*, if not to all theſe cauſes, it is a ſelf-evident truth only when applied to the *efficient cauſe*. Without the actual exertion of *power*, it is indeed moſt certain that nothing could be brought into exiſtence; but it is ſo far from being clear that pre-exiſtent matter, or, as Ariſtotle choſe to expreſs himſelf, a *material cauſe*, muſt be ſuppoſed for infinite power to operate upon, that, we think, every man may find complete evidence of the contrary in himſelf. That ſenſation, intelligence, conſciouſneſs, and volition, are not the reſult of any modifications of figure and motion, is a truth as evident as that conſciouſneſs is not ſwift, nor volition ſquare. If then theſe be the powers or properties of a being diſtinct from matter, which we think capable of the completeſt proof, every man who does not believe that his mind has exiſted and been conſcious from eternity, muſt be convinced that the power of creation has been exerted in himſelf. If it be denied that there is any immaterial *ſubſtance* in man, ſtill it muſt be confeſſed, that, as matter is not eſſentially conſcious, and cannot be made ſo by any particular organization, there is ſome real *thing* or *entity*, call it what you pleaſe, which has either exiſted and been conſcious from eternity, or been in time brought from non-entity into exiſtence by an exertion of infinite power.

To this perhaps ſome one may object, that upon our own ſuppoſition of the inability of the human mind to exert its faculties but in union with ſome material and organiſed ſyſtem, the mind of every man may have exiſted from eternity without being conſcious of its own exiſtence; and that, therefore, we have in ourſelves no evidence of *creation*, but only of the union of two ſelf-exiſtent ſubſtances, which in their prior ſtate had been diſtinct and ſeparate from each other. But ſuch an objection as this, we beg leave to reply, can ariſe from nothing but miſapprehenſions of our hypotheſis, and of the reaſons by which we think it ſupported. We ſuppoſe, that to the exertion of the human faculties, a body of ſome kind or other may be neceſſary as an inſtrument, not merely for what we obſerve of the dependence of perception and memory on the ſtate of the brain, but becauſe we cannot conceive a Creator of infinite wiſdom and goodneſs to immerſe in ſyſtems of matter, minds to which he knows that ſuch ſyſtems muſt be always uſeleſs and often hurtful. We believe therefore, that our ſouls and bodies were created and formed for each other; but as our preſent adverſaries admit not of a Creator, we muſt aſk them, How their ſelf-exiſtent ſouls have been diſpoſed of from eternity, and by what power they have all in due ſucceſſion been united each to its proper body? as before the union they were not conſcious, they could not unite themſelves; and to ſuppoſe them united by ſome ſuperior intelligence, is to ſuppoſe them in ſome reſpects dependent on that intelligence, which ſeems not to accord with the ſelf-exiſtence. Whatever is ſelf-exiſtent and eternal muſt be independent; and if poſſeſſed of any power, cannot be conceived to have that power limited.—We repeat, therefore, that every man has in himſelf ſufficient evidence that creation is poſſible; for if infinite power can create an immaterial and percipient being, it may ſurely be ſuppoſed capable of creating dead and unintelligent matter.

But the creation of the material ſyſtem may be ſhown to be in the higheſt degree probable by other arguments. The ſame reaſoning which proves the impoſſibility of an infinite ſeries and of eternal time, proves that the univerſe cannot have exiſted from eternity in its preſent ſtate. But if it has not exiſted from eternity in its preſent ſtate, it belongs to the opponents of creation to ſay what was its former. We talk indeed of *chaos*; but ſuch language, when a Creator is not admitted, is moſt unphiloſophical trifling. It appears from the moſt accurate inquiries that have been made into the ſubſtance and eſſence of body ‡, that the atoms of which each maſs is compoſed are held together by a foreign force. If by chaos be meant matter, when this force is ſuppoſed to be removed, we muſt beg leave to ſay, that of ſuch a ſubſtance we have neither idea nor notion, and cannot diſtinguiſh it from non-entity. The original atoms of matter, we believe indeed to require no other agency to keep each entire than that *fiat* by which it was created; but ſtill, as thoſe atoms are conceived to be ſolid and extended, they muſt be capable of diviſion by infinite power; and if that *fiat* or influence which makes them ſolid and extended were removed, they would loſe ſolidity and extenſion, and of courſe become nothing. So far is it, therefore, from being true, that the creation of matter appears to be impoſſible, that we are compelled by every thing that we know of it to believe that matter cannot poſſibly be ſelf exiſtent.

"Becauſe it is undeniably certain, concerning ourſelves (ſays Cudworth †), and all imperfect beings, that none of theſe can create any *new ſubſtance*, men are apt to meaſure all things by their own ſcantling, and to ſuppoſe it univerſally impoſſible for any power whatever thus to create. But ſince it is certain, that imperfect beings can themſelves produce *ſome things* out of nothing pre-exiſting, as *new cogitations*, *new local motion*, and *new modifications* of things corporeal, it is ſurely reaſonable to think that an abſolutely perfect Being can do *ſomething more*, *i. e.* create *new ſubſtances*, or give them their whole being. And it may well be thought as eaſy for God or an Omnipotent Being, to make a whole world, matter and all, ἐξ οὐκ ὄντων, as it is for us to create *a thought* or to move a finger, or for the ſun to ſend out rays, or a candle light; or laſtly, for an opaque body to produce an image of itſelf in a glaſs or water, or to project a ſhadow: all theſe imperfect things being but the *energies*, *rays*, *images*, or *ſhadows*, of the Deity. For a ſubſtance to be made out of nothing by *God*, or a *Being infinetely perfect*, is not for it to be made out of nothing in the impoſſible ſenſe, becauſe it comes from him who is *all*. Nor can it be ſaid to be impoſſible for any thing whatever to be made by that which hath not only *infinitely greater perfection*, but alſo *infinite active power*. It is indeed true, that infinite power itſelf cannot do things in their own nature impoſſible; and, therefore, thoſe who deny creation, ought to prove, that it is abſolutely impoſſible for a *ſubſtance*, though not for an *accident* or *modification*, to be brought from non-exiſtence into *being*. But nothing is in itſelf impoſſible, which does not imply a contradiction: and though it be a contradiction for a thing to be and not to be at the ſame time, there is ſurely no contradiction in conceiving an imperfect being, which before was not, afterwards to be." To call in queſtion the poſſibility of creation, becauſe we have no *adequate conception* how a thing can be brought into exiſtence, would be in the higheſt degree abſurd; for it may be doubted, whether we have *adequate* conceptions of any thing except our own ideas and their various relations (1).

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† See Moſheim's Diſſertation on this ſubject, in his edition on Cudworth's Intellectual Syſtem.

‡ Baxter's Inquiry into the Nature of the Human Soul.

† Intellectual Syſtem, Book i. Chap. 5.

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God a free agent; but

The Being, which is ſelf-exiſtent, omnipotent, and omniſcient, is not a *neceſſary*, but a *free* agent; for *active power* implies *freedom*, and *infinite* power *infinite* freedom. What, therefore, hath no bounds ſet to its power, what can have no oppoſition made to its will, nor reſtraint laid on its actions, muſt both will and act freely. "If the ſupreme cauſe were not a being endowed with liberty and choice, but a mere neceſſary agent, then would it follow, as Dr Clarke well obſerves †, that nothing which is not, could *poſſibly* have been; and that nothing which is, could *poſſibly* not have been; and that no mode or circumſtance of the exiſtence of any thing could *poſſibly* have been in any reſpect otherwiſe than it now actually is. All which being evidently moſt falſe and abſurd; it follows, on the contrary, that the ſupreme cauſe is not a mere neceſſary agent, but a Being endued with liberty and choice."

† Demonſtration of the Being and Attributes of God.

To this reaſoning it has been lately replied †, that "Clarke muſt have known, that all thoſe who contend againſt the free agency of the Deity, do of courſe acknowledge, that nothing could have happened, or does happen, or will happen, but what actually has happened, or doth happen, or will happen; and that it is moſt falſe and abſurd to deny it." It is, therefore, according to the neceſſarians, abſolutely impoſſible, that at preſent there could exiſt upon this earth more or fewer perſons than are now actually alive; that the earth could move in any other direction than from weſt to eaſt; or that there could be more or fewer planets in the ſolar ſyſtem. Yet is it moſt certain, that there *have been fewer perſons* on the earth than there are now; that there is not a cultivated country in Europe which could not contain *more* people than now inhabit it; that the comets move in very different directions from that of weſt to eaſt; and that as, till very lately, we *conceived* only ſix primary planets in the ſyſtem, it is evidently *poſſible* that the ſyſtem *might contain* no more. Upon the ſuppoſition, therefore, that the Supreme Being acts under a phyſical neceſſity, the ſame things are poſſible and not poſſible at the ſame time, which is the groſſeſt of all abſurdities. It might have been objected with much more plauſibility, that the firſt cauſe cannot poſſibly be free, becauſe he muſt needs do always what is beſt in the whole; but it will be ſeen by and by, that among different created ſyſtems, there is no reaſon for ſuppoſing any one abſolutely *beſt*.

† Cooper's Tracts.

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himſelf unchangeable.

But though this Being is *free*, and as ſuch the author of *change* in other beings, yet he muſt himſelf be *unchangeable*; for all changes have a beginning, and conſequently are the effects of ſome *prior cauſes*. But there can be nothing prior to the exiſtence of this Being, as he is *eternal*; neither any *cauſe* of it, as he is *independent*; nor conſequently any *change* in it, except we could ſuppoſe him to *change himſelf*, which is the ſame abſurdity as to *produce* himſelf, *i. e.* to be at *the ſame time both effect* and *cauſe*.

307
Omniſcience, &c. proved in a different manner.

Omniſcience, as well as ſome of the foregoing attributes of the Supreme Being, may perhaps be more eaſily deduced thus §. We find in ourſelves ſuch qualities as *thought* and *intelligence*, *power* and *freedom*, &c. for which we have the evidence of conſciouſneſs as much as for our own exiſtence. Indeed, it is only by our conſciouſneſs of theſe that our exiſtence is known to ourſelves. We know likewiſe that theſe are *perfections*, and that to have them is better than to be without them. We find alſo that they have not been in us from eternity. They muſt, therefore, have had a *beginning*, and conſequently ſome *cauſe* for the very ſame reaſon that a *being* beginning to exiſt in time requires a cauſe. Now this cauſe, as it muſt be *ſuperior* to its *effect*, muſt have thoſe perfections in a *ſuperior* degree; and if it be the *firſt cauſe*, it muſt have them in an *infinite* or *unlimited* degree, ſince *bounds*, or *limitation* without a limiter, would as we have already ſhown, be an *effect* without a *cauſe*.

§ Notes to King on Evil.

It is indeed obvious, that the *omniſcience* of the Supreme Being is implied in his very exiſtence. "For all things being not only preſent to him, but alſo entirely

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(1) "Ridicula foret et inepta ejus temeritas, qui corporum ideo creationem ſibi duceret negandum eſſe, quod ejus creationis *clarum et perſpicuum notionem* effingere cogitatione nobis haud licet. Infinita enim eſt rerum copia, quarum perſpicuis et apertis caremus notionibus. Et ſi omnia neganda continuo nobis eſſent, quorum confuſam tantam et imperfectam conſequi poſſumus notionem, omnia fere nobis eſſent neganda exceptis *relationibus*, quos inter notiones quaſdam abſtractas eſſe intelligimus. Quis interiorem ſibi naturam rerum, tam corporum, quam ſpirituum, cognitam eſſe dixerit? Et eſſe tamen has naturas, omni plane dubitatione vacat. Quis quemadmodum altera harum naturam agat in alteram, ſeſe ſcire, affirmet? Quis cauſas ſibi patere, propter quas hi vel illi effectus, quos videmus quotidie contingere, a certis veniant corporibus, jure glorietur? Nec tamen quiſquam eſt, qui vel illam animæ in corpus operationem, vel hos effectus in dubium revocare auſit. Teneamus igitur ea, quæ certo novimus, nec idcirco nos ab illis dimoveri patiamur, quod multa rurſus ſunt, quorum naturam ignoramus; contra multa nos fugere et cognitionem noſtram ſuperare, æquo et tranquillo feramus animo. *Joannis Clerici contra eos qui negant, ex nihilo ulla ratione fieri poſſe aliquid, obſervationes; in Moſheimii edit. Intellec. Syſt.*

Of the Being and Attributes of God.

tirely *depending* upon him, and having *received* both their *being* itſelf and all their powers and faculties *from him*, it is manifeſt that as he knows all things that are, and penetrates every part of their ſubſtance with his all-ſeeing eye, ſo muſt he likewiſe know *all poſſibilities* of things, that is, all effects that *can be*. For, being alone ſelf-exiſtent, and having alone given to all things all the powers and faculties with which they are endued, it is evident that he muſt of neceſſity know perfectly what all and each of theſe powers and faculties, *which are derived wholly from himſelf*, can poſſibly produce. And ſeeing at one boundleſs view, or more properly in his own ideas, all the poſſible compoſitions and diviſions, variations and changes, circumſtances and dependencies of things, all their poſſible relations one to another, and their diſpoſitions or fitneſſes to certain and reſpective ends, he muſt without poſſibility of error know exactly what is beſt and propereſt in every one of the numberleſs poſſible caſes, or methods of diſpoſing things; and underſtand perfectly how to order and direct the reſpective means to bring about what he ſo knows to be in its kind, or on the whole, the beſt and fitteſt in the end. This is what is meant by infinite wiſdom, or omniſcience †;" and it has been readily admitted by every man who has believed in the exiſtence of a God as the creator and preſerver of all things.

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God foreknows the actions of free agents.

Doubts, however, have been entertained by theiſts, and pious theiſts, whether omniſcience itſelf can certainly foreknow what are called contingent events, ſuch as the actions of free agents; and ſome few there are profeſſing to be even Chriſtians, who have boldly pronounced ſuch knowledge to be impoſſible. That we have no adequate notion *how* events, which are called contingent, can be certainly foreknown, muſt indeed be granted; but we are not, therefore, authoriſed to ſay that ſuch knowledge is impoſſible, unleſs it can be clearly ſhown to imply a contradiction. They who ſuppoſe that it implies a contradiction, muſt likewiſe ſuppoſe, that, where there is not a chain of neceſſary cauſes, there can be no certainty of any future event; but this is evidently a miſtake. " For let us ſuppoſe that there is in man a power of beginning motion, and of acting with what has of late been called *philoſophical* freedom; and let us ſuppoſe farther that the actions of ſuch a man cannot poſſibly be foreknown; will there not yet be in the nature of things, notwithſtanding this ſuppoſition, the ſame *certainty of event* in every one of the man's actions, as if they were ever ſo fatal and neceſſary? For inſtance, ſuppoſe the man, by an internal principle of motion, and an abſolute freedom of mind, to do ſome particular action *to-day*, and ſuppoſe it was not poſſible that this action ſhould have been foreſeen *yeſterday*, was there not nevertheleſs the ſame *certainty of event* as if it had been foreſeen, and abſolutely neceſſary? That is, would it not have been as *certain a truth* yeſterday, and from eternity, that this action was in event *to be performed to-day*, notwithſtanding the ſuppoſed freedom, as it is now a *certain and infallible truth* that it is performed? Mere *certainty of event*, therefore, does not in any meaſure imply *neceſſity* †." And ſurely it implies no contradiction to ſuppoſe, that every future event which in the nature of things is *now certain*, may *now be certainly known* by that intelligence which is omniſcient. The *manner* how God can foreknow future events, without a *chain of neceſſary cauſes*, it is indeed impoſſible for us to explain: yet ſome ſort of *general notion* of it we may conceive. " For, as a man who has no influence over another perſon's actions, can yet often perceive beforehand what that other will do; and a wiſer and more experienced man, with ſtill *greater probability* will foreſee what another, with whoſe diſpoſition he is perfectly acquainted, will in certain circumſtances do; and an angel, with ſtill *leſs degrees of error*, may have a further proſpect into mens future actions: ſo it is very reaſonable to conceive, that God, without influencing mens wills by his power, or ſubjecting them to a chain of neceſſary cauſes, cannot but have a knowledge of future free events, as much *more certain* than men or angels can poſſibly have, as the *perfection* of *his* nature is greater than that of *theirs*. *The diſtinct manner how* he foreſees theſe things we cannot, indeed, explain; but neither can we explain the *manner* of numberleſs other things, of the reality of which, however, no man entertains a doubt †." We muſt therefore admit, ſo long as we perceive no contradiction in it, that God always knows all the free actions of men, and all other beings endued with liberty; otherwiſe he would know many things now of which he was once ignorant, and conſequently his *omniſcience* would receive addition from events, which has been already ſhown to be contrary to the true notion of infinity.— In a being incapable of change, knowledge has nothing to do with *before* or *after*. To every purpoſe of knowledge and power, all things are to him equally preſent. He knows perfectly every thing that is, and what to us is future he knows in the very ſame manner as he knows what to us is preſent.

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God infinitely perfect, all-ſufficient, and omnipreſent.

Thus have we demonſtrated the neceſſary exiſtence of a being who is *eternal*, *independent*, *unchangeable*, *omnipotent*, *free in his actions*, and *omniſcient*; and this is the being whom we worſhip as GOD. *Eternity*, *independence*, *immutability*, *omnipotence*, *liberty*, and *omniſcience*, which ſeem to be all the *natural* attributes which we can diſcover in the divine nature, as they are conceived to be differently combined, made us ſpeak of him in different terms. His enjoying in an abſolute manner every conceivable power or perfection, makes us call him a Being *infinitely perfect*. His being capable of no want, defect, or unhappineſs of any kind, denotes him to be *all-ſufficient in himſelf*; and the unlimited exerciſe of his knowledge and power, demonſtrates him to be *omnipreſent*. That ſuch a Being muſt be incomprehenſible by us, and by every creature, is a truth ſelf-evident; and yet in all ages men of the beſt intentions have been vainly attempting this impoſſibility. The manner of his omniſcience, for inſtance, has been the ſubject of much diſputation among thoſe who ought to have reflected that they knew not how their own minds were preſent to their own bodies.— The celebrated Dr Clarke and his adherents, who conſidered ſpace as the *ſine qua non* of all other things, inſiſted, that God muſt be infinitely extended; and that, as wherever his ſubſtance is, there his attributes muſt be, it is thus that his knowledge and power are preſent with every creature. But this notion labours under inſuperable difficulties.

For " if the Divine ſubſtance be infinitely extended, then will there be part of it in this place and part

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† Clarke's Demonſtration, &c.

† Clarke's Demonſtration, &c.

† Clarke's Demonſtration, &c.

310 The manner of the Divine Omnipreſence incomprehenſible.

in that. It muſt be commenſurate with all particular beings, ſo that ſome will occupy more and ſome leſs of its dimenſions. By this account it will be very proper and philoſophical to ſay, that God is not in *heaven*, but only a *part* of him; and that an *elephant* or a *mountain*, a *whale* or a wicked *giant*, have more of the eſſence or preſence of God with them than the *holieſt* or *beſt* man in the world, unleſs he be of equal ſize: all which, as has been well obſerved †, are at leaſt harſh and grating expreſſions. As the attributes of the Divine Being muſt be conſidered in the ſame manner with his ſubſtance, we ſhall likewiſe, upon this notion of omnipreſence, have a part of his knowledge and power in this place, and a part of them in that; and of theſe parts the one muſt be greater or leſs than the other according to the dimenſions of the place with which it is commenſurate; which is a ſuppoſition that appears to us harſher, if poſſible, than even the former.

"Should it be ſaid that the Divine attributes are not to be conſidered as having parts (though we ſee not how they can be conſidered otherwiſe than as their ſubject), they muſt then exiſt *completely* in every point of this immenſe expanſion. Be it ſo; and what follows? Why, every point of this infinitely expanded being will be omniſcient and omnipotent by itſelf; an inch of it will have as much wiſdom and power as a yard, a mile, or the whole; and, inſtead of one infinite wiſdom and power, we ſhall have millions: For as theſe parts of the ſubſtance are conceived, *diſtinctly*, and one individual part is not another, ſo muſt the attributes be likewiſe conceived, and the individual power and knowledge of one part be diſtinct from that of another." And if ſo, it follows, that one point of this expanded being has equal power and intelligence with the whole; ſo that the notion of extenſion being *neceſſary* to God's preſence with every creature, involves in it the moſt palpable contradiction. That God is at all times and in all places ſo preſent with every creature as to have an abſolute knowledge of and power over it, is indeed capable of the ſtricteſt demonſtration; but we think it great preſumption to aſſign the particular *mode* of his preſence, eſpecially ſuch a one as is neither agreeable to the nature of an abſolutely perfect Being, nor in the leaſt neceſſary to the exerciſe of any one perfection which he can be proved to poſſeſs. Philoſophers and divines have offered ſeveral names for the manner in which God is preſent with his works; but we chooſe rather to confeſs, that the *manner* of his preſence is to us, and probably to every creature, wholly incomprehenſible. Nor need we be ſurpriſed or ſtaggered at this, when we reflect that the manner in which our own minds are preſent with our bodies is to us as incomprehenſible as the manner in which the ſupreme Mind is preſent with every thing in the univerſe. That our minds have a power over our limbs, we know by experience: but that they are not extended or ſubſtantially diffuſed through them, is certain; becauſe men daily loſe arms and legs without loſing any part of their underſtanding, or feeling their energies of volition in the ſmalleſt degree weakened. But we need purſue this ſubject no farther. It has been confeſſed by one of the moſt ſtrenuous advocates ‡ for the extenſion of the Deity and all minds, that "there is an incomprehenſibleneſs in the *manner* of every thing, about which no controverſy can or ought to be concerned."

311 God's moral attributes reſult from his natural perfections.

The moral attributes of God may be deduced from his natural ones, and are immediate conſequences of them when exerciſed on other beings. They may be termed his *ſecondary relative* attributes, as they ſeem to be the perfection of his *external acts* rather than any *new internal* perfections. And though the exiſtence of any moral quality or action is not capable of ſtrict *demonſtration*, becauſe every moral action or quality, as ſuch, depends upon the *will* of the agent, which muſt be abſolutely free; yet we have as great aſſurance that there are moral qualities, in God, and that he will always act according to theſe qualities, as the nature of the thing admits; and may be as well ſatisfied of it, as if it were capable of the moſt rigid demonſtration This important point, however, cannot be ſo clearly or ſo firmly eſtabliſhed by abſtract reaſoning as by taking a ſcientific view of the works of creation, which evince the goodneſs, holineſs, and juſtice, of their Author, as well as his perfect wiſdom and infinite power. The conſideration, therefore, of the moral attributes of God, together with his providence, and the duties thence incumbent on man, is the proper buſineſs of other articles (ſee RELIGION, THEOLOGY, and MORAL *Philoſophy.*)

312 How they ought to be conceived.

At preſent we ſhall only obſerve, that by reaſoning *à priori* from his exiſtence and his natural perfections, we muſt neceſſarily infer that his actions are the reſult of unmixed benevolence. Every wiſe agent has ſome end in view in all his actions; it being the very eſſence of folly to act for no end: but there cannot be an end of action which is not either ſelfiſh or benevolent. Selfiſhneſs is the offspring of want and imperfection, and is therefore the ſource of moſt *human* actions; becauſe men are weak and imperfect beings, capable of daily additions to their happineſs When the thief plunders a houſe at midnight, when the highwayman robs a traveller on the road, and even when the aſſaſſin murders the man who never injured him: it will be found that their actions ſpring not from an innate deſire to inflict miſery upon others, but from a proſpect of reaping advantage to themſelves. The object of the thief and the robber is obvious: it is to gain money, which is the mean of procuring the comforts of life. Even the aſſaſſin has always the ſame ſelfiſh end in view: either he is bribed to commit the murder, or he fancies that his horrid deed will remove an *obſtacle* from the way to his own happineſs. But they are not vicious men *only* who act from ſelfiſh conſiderations: much of human *virtue*, when traced to its ſource, will be found to have its origin in the deſire of happineſs. When a man gives his money to feed the hungry and to clothe the naked, he believes that he is acting agreeably to the will of Him to whom he and the poor ſtand in the ſame relation; and he looks for a future and eternal reward. By continuing the practice, he ſoon acquires the habit of benevolence; after which, indeed, he looks for no further reward, when performing particular actions, than the immediate pleaſure of doing good. This ſelfiſhneſs of man is the neceſſary conſequence of his progreſſive ſtate. But the Being who is independent, omnipotent, omniſcient, and, in a word, poſſeſſed of every poſſible per-

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† Watt's Eſſays, and Law's Inquiry into the Ideas of Space, Time, and Immenſity, &c.

‡ Mr Jackſon's Exiſtence and Unity, &c. page 110.

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perfection, is incapable of progreſſion, or of having any acceſſion whatever made to his happineſs. He is immutable; and muſt of neceſſity have been as happy from eternity, when exiſting alone, as after the creation of ten thouſand worlds. When, therefore, he willed the exiſtence of other beings, he could have nothing in view but to communicate ſome reſemblance of his own perfections and happineſs. That he had *ſome* end in view follows undeniably from his infinite wiſdom. That he could not have a *ſelfiſh* end, follows with equal certainty from his own infinite perfections; and as there is no medium, in the actions of a wiſe Being, between ſelfiſhneſs and benevolence, we muſt neceſſarily conclude, that the creation was the reſult of unmixed benevolence or perfect goodneſs. The other moral attributes of the Deity, his juſtice, mercy, and truth, ought therefore to be conſidered only as ſo many different views of the ſame *goodneſs* in the *Creator*, and various ſources of *happineſs* to the *creature*. Theſe are always *ſubordinate* to and *regulated* by this one principal perfection and brighteſt ray of the Divinity.

" Thus we conceive his *juſtice* to be exerted on any being no farther than his goodneſs neceſſarily requires, in order to make that being, or others, *ſenſible* of the *henious nature* and *pernicious effects of ſin* †, and thereby to bring them to as great a degree of happineſs as their ſeveral natures are capable of. His *holineſs* hates and abhors all wickedneſs, only as the neceſſary conſequences are abſolute and unavoidable miſery; and his veracity or faithfulneſs ſeems to be concerned for truth, only becauſe it is connected with, and productive of the happineſs of all rational beings; to provide the propereſt means for attaining which great end is the exerciſe of his *wiſdom*." Such is the view of God's moral attributes, which the abſtract contemplation of his natural perfections neceſſarily gives; and whether this way of conceiving them be not attended with leſs difficulty than the common manner of treating them under the notion of two infinites *diametrically oppoſite*, muſt be left to the judgment of the reader.

313
The origin of evil.

But if the Creator and ſupreme Governor of all things be a Being, of infinite power, perfect wiſdom, and pure benevolence, how came evil into the works of creation? This is a queſtion which has employed the ſpeculative mind from the firſt dawning of philoſophy, and will continue to employ it till our faculties be enlarged in a future ſtate, when philoſophy ſhall give place to more perfect knowledge. To theſe meditations, as has been well obſerved ‡, humanity is not equal. Volumes have been written on the ſubject; but we believe that the following extract from Dr Clarke contains all that can be advanced with certainty and all that is neceſſary to vindicate the ways of God to man.

" All that we call evil (ſays that able reaſoner ‖), is either an *evil of imperfection*, as the want of certain faculties and excellencies which other creatures have; or *natural evil*, as pain, death, and the like; or *moral evil*, as all kinds of vice. The *firſt* of theſe is not properly an evil: for every power, faculty, or perfection, which any creature enjoys, being the free gift of God, which he was no more obliged to beſtow than he was to confer being or exiſtence itſelf, it is plain, that the want of any certain faculty, or perfection, in any kind of creatures, which never belonged to their nature, is no more an evil to them, than their never having been created or brought into being at all could properly be called an evil." To this we may add, that as no created being can be ſelf-exiſtent and independent, imperfection is unavoidable in the creation, ſo that the evil of defect (as it is moſt abſurdly called) muſt have been admitted, or nothing could ever have exiſted but God. " The *ſecond* kind of evil, which we call *natural* evil, is either a neceſſary conſequence of the former, as *death* to a creature on whoſe nature immortality was never conferred; and then it is no more properly an evil than the former: Or elſe it is counterpoiſed in the whole with as great or greater good, as the *afflictions and ſufferings of good men*; and then alſo it is properly no evil: Or elſe it is a *puniſhment*; and then it is a neceſſary conſequence of the *third* and laſt ſort of evil, viz. *moral evil*. And *this* ariſes wholly from the abuſe of *liberty*, which God gave to his creatures for other purpoſes, and which it was reaſonable and fit to give them for the perfection and order of the whole creation: only they, contrary to God's intention and command, have abuſed what was neceſſary for the perfection of the whole, to the corruption and depravation of themſelves. And thus have all ſorts of evils entered into the world without any diminution to the infinite goodneſs of its Creator and Governor."

314
Whether the preſent be the beſt ſyſtem poſſible.

But though evil could not be totally excluded from the univerſe, are we not authoriſed to infer, from the infinite power, wiſdom, and goodneſs of the Creator, that the preſent ſyſtem is upon the whole the very beſt ſyſtem poſſible? Undoubtedly we are, if of poſſible ſyſtems there *can be a beſt*; but this is ſo far from being evident, that we think it implies a contradiction. A beſt of beings there is, *viz.* God, who is poſſeſſed of infinite perfections; but there cannot be a beſt of creatures or of created ſyſtems. To prove this, we need only reflect, that wherever creation ſtops, it muſt ſtop infinitely ſhort of infinity; and that how perfect ſoever we conceive any creature or ſyſtem of creatures to be, yet the diſtance between that and God is not leſſened, but continues infinite. Hence it follows, that the nature of God and his omnipotence is ſuch, that whatever number of creatures he has made, he may ſtill add to that number, and that however good or perfect the ſyſtem may be on the whole, he might ſtill make others equally good and perfect.

315
Origin of that queſtion.

The diſpute, whether a being of infinite power, wiſdom, and benevolence, muſt be ſuppoſed to have created the *beſt poſſible ſyſtem*, and the embarraſſment of men's underſtandings about it, ſeem to have ariſen from their taking the words *good*, *better*, and *beſt*, for abſolute qualities inherent in the nature of things, whereas in truth they are only relations ariſing from certain appetites. They have indeed a foundation, as all relations have, in ſomething abſolute, and denote the thing in which they are founded; but yet they themſelves imply nothing more than a relation of congruity between ſome appetite and its objects. This is evident; becauſe the ſame object, when applied to an appetite to which it has a congruity, is good; and bad, when applied to an appetite to which it has no congruity. Thus, the earth and air to terreſtrial animals are good elements, and neceſſary to their preſervation: to thoſe animals the water is bad, which yet affords

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† Notes to King on Evil.

‡ Johnſon's Review of a free Inquiry into the Origin of Evil.

‖ Demonſtration of the Being and Attributes of God.

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affords the beſt receptacle to fiſhes. *Good*, therefore, being relative to appetite, that muſt be reckoned the beſt creature by us which has the ſtrongeſt appetites, and the ſureſt means of ſatisfying them all, and ſecuring its own permanent happineſs. And though the *ſubſtance* of creatures is chiefly to be regarded as contributing to their perfection, yet we have no way of meaſuring the perfection of different ſubſtances but by their qualities, *i. e.* by their appetites by which they are ſenſible of good and evil, and by their powers to procure thoſe objects from which they receive that ſenſe of things which makes them happy.

316 No ſyſtem abſolutely beſt.

It is plain, therefore, that whatever ſyſtem we ſuppoſe in nature, God might have made another equal to it; his infinite wiſdom and power being able to make other creatures equal in every reſpect to any that we know or can conceive, and to give them equal or ſtronger appetites, and as certain or more certain ways of ſatisfying them. We ſee in many caſes, that very different means will anſwer the ſame end. A certain number of regular pyramids will fill a ſpace; and yet irregular ones will do it as well, if what we take from the one be added to another; and the ſame thing may be done by bodies of the moſt irregular and different figures in the ſame manner: and therefore we may very well conceive, that the anſwering of appetites, which is all the *natural good* that is in the world, may as well be obtained in another ſyſtem as in this; provided we ſuppoſe, that where the appetites of the ſentient beings are changed, the objects are alſo ſuited to them, and an equal congruity among the parts of the whole introduced. This is ſo eaſily conceived, that in an indefinite number of poſſible worlds, we do not ſee why it may not be done in numberleſs ways by infinite power and wiſdom.

317 God not neceſſitated by his goodneſs to create the preſent in preference to all other worlds.

If then it be plain, that there might have been many other worlds, or even but one, equal to this in all reſpects as to goodneſs, there could be no neceſſity, either phyſical or moral, that God ſhould create the one rather than the other; becauſe nothing could make the one better, or to him more agreeable, than the other, but his own free choice. Either, therefore, God muſt be poſſeſſed of abſolute freedom, or, among a number of poſſibilities equally perfect, he could not have made a choice, and ſo nothing would ever have been created. It is not, then, as Leibnitz and others argue, the natural and neceſſary goodneſs of ſome particular things, *repreſented by the divine ideas*, which determines God to prefer them to all others, if underſtood of his *firſt* act of producing them; but it is his own free choice, which among many equal *potential* goods, makes ſome things *actually* good, and determines them into exiſtence. When theſe are once ſuppoſed to exiſt, every thing or action becomes good which tends to their happineſs and preſervation; and to ſuppoſe their all-perfect Author to have any other end in view than their preſervation and happineſs, is the ſame abſurdity as to ſuppoſe that knowledge may produce ignorance; power, weakneſs; or wiſdom folly.

We have now finiſhed what we propoſed under the article Metaphyſics. It has ſwelled in our hands to a large extent; and yet it can be conſidered as little more than an introduction to that ſcience, which comprehends within its wide graſp every thing exiſting. The reader who wiſhes to purſue theſe intereſting ſpeculations, ſhould ſtudy diligently the authors whom we have conſulted, and to whom we have been careful to refer in the margin. Were we to make a ſelection, we ſhould without heſitation recommend Ariſtotle and Plato among the ancients; and Cudworth, Locke, Hartley, and Reid, among the moderns. Theſe philoſophers, indeed, on many points, differ exceedingly from one another; but he who wiſhes not to adopt opinions at random, ſhould know what can be ſaid on both ſides of every queſtion.

METAPLASMUS, in grammar, a tranſmutation or change made in a word, by adding, retrenching, or altering a ſyllable or letter thereof.

METAPONTUM, or METAPONTIUM, (anc. geog.), a town of Lucania, on the Sinus Tarentinus, to the weſt of Tarentum; built by the Pylians, who returned from Troy, (Mela.) Where Pythagoras is ſaid to have taught in the time of Servius Tullius, (Livy). *Metapontini*, the people; who pretended to ſhow, in a temple of Minerva, the tools with which Epeus built the wooden horſe, (Juſtin). Now a tower, called *Torre di Mare*, in the Baſilicata of Naples, (Baudrand.)

METASTASIO (l' abbe Pierre Bonaventure), whoſe real name was *Trapaſſi*, was born at Aſſiſe, on January 3d, 1698. His talent for poetry was firſt unfolded by the reading of Taſſo; and he began to compoſe verſes at ten years of age. "A prodigy of this nature (ſays Metaſtaſio) made ſuch an impreſſion on my maſter, the celebrated Gravina, that he thence-forth conſidered me as a plant worthy of being cultivated by his own hands." Metaſtaſio was only fourteen years of age when he compoſed his tragedy entitled *Il Giuſtino*; in which he appears too cloſe and ſcrupulous an imitator of the Grecian drama. Our young poet unfortunately loſt his patron in 1717; who left him his heir, "as being a young man of the moſt promiſing abilities." Metaſtaſio, at the age of nineteen, being, in conſequence of this inheritance, ſuperior to thoſe wants which repreſs the exertions of genius, and to which men of abilities are too often ſubject, gave full ſcope to his inclination for poetry. He began his dramatic career with the *Didonne Abandonnata*, which was acted at Naples in 1724; the muſic was compoſed by Sarro. He ſoon acquired ſuch celebrity, that in 1729 he was invited to Vienna by the emperor Charles VI.; who appointed him imperial poet, and granted him a penſion of 4000 florins. From that time ſome of his works were preſented at every court-feſtival; and notwithſtanding the extreme magnificence of theſe entertainments, they ſhould now be forgotten were it not for the verſes which he compoſed upon the occaſion. The courts of Vienna and Madrid vied with each other in the preſents which they conferred upon him. From Maria Thereſa he received a ſnuff-box and a port-folio ſet with diamonds, and a golden candleſtick with a ſcreen. Ferdinand VI. King of Spain, informed of the great merit of Metaſtaſio by Farinelli, of whom he was a paſſionate admirer, ſent him a preſent of a caſket mounted with gold, and furniſhed with the different implements of writing. This favourite of kings and of the muſes was of a cheerful temper, and was exceedingly temperate: to this he was probably indebted for the uninterrupted health which he enjoyed, and for the entire perfection of his ſenſes and faculties to the moſt advanced period of old-age. He took his meals, aroſe, and went to bed, always at ſtated hours. This exactneſs and order were ſcrupulouſly obſerved even in the moſt trifling actions of his life. He uſed to ſay in jeſt, that he dreaded hell for no other reaſon but becauſe it was a place *ubi nullus ordo, ſed ſempiternus horror inhabitat*. He had even his ſtated hours for making verſes; to which he ſcrupulouſly adhered, without waiting for the moment of poetical enthuſiaſm. He was equally regular in the duties of the Chriſtian as in the labours of the ſcholar. His behaviour was that of a true philoſopher: his ambition extended no farther than the attainment of literary fame; and he deſpiſed every civil mark of diſtinction. When Charles VI. offered him the titles of *Count* or of *Baron*, which add no real worth or dignity to the poſſeſſor, but frequently make him appear in a more ridiculous light, he inſtantly begged the favour that he would allow him ſtill to continue *Metaſtaſio*. The empreſs Maria Thereſa afterwards wiſhed to beſtow upon him the ſmall croſs of St Stephen; but he excuſed himſelf on account of his age, which would prevent him from aſſiſting at the feſtivals of the order. He was attacked by a fever on the 2d of April 1782; and he died on the 12th of the ſame month, at the age of 84. Before his death he received the ſacrament according to the form of the Romiſh church; and Pius VI. who was then at Vienna, ſent him his apoſtolical benediction *in articulo mortis*. He left about 150,000 florins. He compoſed a great number of tragic operas, and ſeveral ſmall dramatic pieces which have been ſet to muſic. We have different editions of them in 4to, 8vo, and 12mo; and M. Richelet has publiſhed a tranſlation of them into French, in 12 vols, ſmall 12mo.

The greateſt part of Metaſtaſio's writings will confer immortality on their author. His dialogue is natural, ſimple, and eaſy; his ſtyle is always pure and elegant, and ſometimes ſublime and pathetic. His ſubjects are noble, intereſting, and excellently adapted for repreſentation. He was perfectly acquainted with the reſources of his art, and has ſubjected the opera to rules. He ſtripped it of its machinery, and of the marvellous, which was fitted to excite the gaze of aſtoniſhment, but which gave no inſtruction to the underſtanding, and made no impreſſion on the heart. His deſcriptions are copied from nature; the ſituations of his characters never fail to raiſe an intereſt in the reader, and often excite the tear of pity. His fables are celebrated; his characters are noble and well ſupported; his plots are excellently conducted, and happily unravelled. "There are ſcenes (ſays Voltaire) worthy of Corneille when he does not declaim, and of Racine when he is not feeble." His operas, in point of the pathetic, may be compared with our fineſt tragedies; and may be read with great pleaſure, independent of the charms of the muſic. We muſt not, however, expect to find in Metaſtaſio that exact regularity, and that fertile ſimplicity, which conſtitutes the excellence of ſome of our tragic poets: But though he ſometimes tranſgreſſes the unities of time and place, he always preſerves the unity of intereſt. Notwithſtanding all theſe advantages, ſome critics will not allow him the merit of invention, which is the firſt qualification of a poet. They conſider him only as a ſucceſsful imitator of the French tragic writers, from whom a great part of his beauties are borrowed, and place him at the head of the fineſt wits of Italy, but deny that he poſſeſſed genius. He was a fond admirer of the ancients; and this admiration, increaſing with the ſolidity of his underſtanding, continued to the laſt period of his life. He recommended reading them, as he himſelf had done, in a chronological order. His memory was excellent, and continued unimpaired even in old age. Horace was his favourite author, and he could repeat almoſt the whole of him. Metaſtaſio, who, as we have obſerved, was the pupil of the celebrated Gravina, added a gentleneſs of character peculiar to himſelf to the accuracy of thinking and great erudition of his maſter. His abilities and fame were reſpected by the critics in general; and whereas the life of moſt men of letters is one continued warfare, his days happily glided away in tranquillity and peace. The circumſtance which occaſioned the change of his name is thus related in a late anecdote: "Gravina's barber, who, like moſt of his profeſſion, was a great talker, one day informed him, that in the *Place de la Valicella*, where he had his ſhop, a young boy came every evening, and ſung extempore verſes of his own compoſition, ſo harmonious and elegant that all the paſſengers ſtopped to liſten to them. Gravina, upon this information, added one to the number of the young poet's audience, and found the verſes ſo ſuperior to the idea which he had formed of them from the account of the barber, and ſo much above the capacity of a child of ten or eleven years of age, that he inſtantly determined to undertake the cultivation of ſo promiſing a plant. His firſt care was to put the young *Trapaſſi* (which was the boy's name) to ſchool; but apprehending that the ordinary methods of education might check the progreſs of ſo uncommon talents, he took him home to his own houſe, and changed his name into *Metaſtaſio*, which ſignifies the ſame thing in Greek. In ſhort, by a plan of education and by inſtruction ſuited to his genius, Gravina laid the foundation of that reputation which he predicted, and which Metaſtaſio now enjoys." *Vies des Hommes Illuſtres d' Italie, Tom.* I. *p.* 187.

METASTASIS, in medicine, a tranſpoſition or ſettlement of ſome humour or diſeaſe in ſome other part; and ſometimes it ſignifies ſuch an alteration of a diſeaſe as is ſucceeded by a ſolution.

METATARSUS (*μετα beyond*, and *ταρσος the tarſus*), in anatomy, that part of the human ſkeleton containing containg the middle of the foot. See Anatomy, n° 70.

METATHESIS, in grammar, a ſpecies of the metaplaſmus; being a figure whereby the letters or ſyllables of a word are tranſpoſed, or ſhifted out of their uſual ſituations, as *piſtris* for *priſtis*, *Lybia* for *Libya*, &c.

This word is, by phyſicians, uſed with reſpect to morbific cauſes, which, when they cannot be evacuated, are removed to places where they are leſs injurious.

METELIN, the modern name of the Iſland of Leſbos. See Lesbos and Mitylene.

In the Iriſh Philoſophical Tranſactions for 1789, we have a deſcription of this iſland by the earl of Charlemont, in which he ſpeaks in Raptures of its beauties. "The mountains, whoſe rugged tops exhibit a pleaſing interſperſion of rocks and fine groves, have their green ſides, for many miles along the coaſt, covered with olives, whoſe leſs agreeable verdure is corrected, embelliſhed, and brightened by a lively mixture of bays and laurels aſpiring to the height of foreſt trees, of myrtles and pomegranates, of arbutes rich at once in bloſſom and in berry, of mulberries growing wild and laden with fruit, &c. Winter is here unknown, the verdure is perpetual, and the frequency of evergreens gives to December the colour of June. The parching heat of ſummer is never felt; the thick ſhade of trees, and thouſands of cryſtal ſprings which every where ariſe and form themſelves into unnumbered rivulets, joined to the refreſhing ſea-breezes the conſtant corrective and companion of noon tide heat, qualify the burning air and render the year a never-ending May. The houſes are conſtructed in ſuch a manner as to have the beſt view of theſe natural beauties. Each is a ſquare tower neatly built of hewn ſtone, ſo high as to overtop the trees, and to command a view of the ſea and neighbouring iſlands. The lower ſtories are granaries and ſtorehouſes; and the habitable apartments are all at top, to which you aſcend by a ſtone ſtair, built for the moſt part on the outſide, and ſurrounding the tower; ſo that from the apartment the trees are overlooked, and the whole country is ſeen, while the habitations themſelves, which are very numerous, appearing above the groves, add life and variety to the enchanting proſpect, and give an air of human population to theſe woodlands, which might otherwiſe be ſuppoſed the region of Dryads, of Naiads, and of Satyrs."

The moſt remarkable thing however, in this iſland is a cuſtom by which the women have here openly uſurped thoſe rights of ſovereignty which in other countries are ſuppoſed to belong eſſentially to the men. "Contrary (ſays his lordſhip) to the uſage of all other countries, the eldeſt daughter here inherits; and the ſons, like daughters every where elſe, are portioned off with ſmall dowers, or, which is ſtill worſe, turned out pennyleſs to ſeek their fortune. If a man has two daughters, the eldeſt at her marriage, is intitled to all her mother's poſſeſſions, which are by far the greater part of the family eſtate, as the mother, keeping up her prerogative, never parts with the power over any portion of what ſhe has brought into the family, until ſhe is forced into it by the marriage of her daughter; and the father alſo is compelled to ruin himſelf by adding whatever he may have ſcraped together by his induſtry. The ſecond daughter inherits nothing, and is condemed to perpetual celibacy. She is ſtyled a *calogria*, which ſignifies properly a religious woman or nun, and is in effect a menial ſervant to her ſiſter, being employed by her in any office ſhe may think fit to impoſe, frequently ſerving her as waiting-maid, as cook, and often in employments ſtill more degrading. She wears a habit peculiar to her ſituation, which ſhe can never change; a ſort of monaſtic dreſs, coarſe, and of a dark brown. One advantage, however, ſhe enjoys over her ſiſter, that whereas the elder, before marriage, is never allowed to go abroad, or to ſee any man, her neareſt relations only excepted, the calogria, except when employed in domeſtic toil, is in this reſpect at perfect liberty. But when the ſiſter is married, the ſituation of the poor calogria becomes deſperate indeed, and is rendered ſtill more humiliating by the compariſon between her condition and that of her happy miſtreſs. The married ſiſter enjoys every ſort of liberty; the whole family fortune is hers, and ſhe ſpends it as ſhe pleaſes; her huſband is her obſequious ſervant, her father and mother are dependent upon her, ſhe dreſſes in a moſt magnificent manner, covered all over, according to the faſhion of the iſland, with pearls and with pieces of gold, which are commonly ſequins; thus continually carrying about her the enviable marks of affluence and ſuperiority, while the wretched calogria follows her as a ſervant, arrayed in ſimple homeſpun brown, and without the moſt diſtant hope of ever changing her condition. Such a diſparity may ſeem intolerable, but what will not cuſtom reconcile? Neither are the misfortunes of the family yet at an end. The father and mother, with what little is left them, contrive by their induſtry to accumulate a ſecond little fortune; and this, if they ſhould have a third daughter, they are obliged to give to her upon her marriage; and the fourth, if there ſhould be one, becomes her calogria; and ſo on through all the daughters alternately. Whenever the daughter is marriageable, ſhe can by cuſtom compel the father to procure her a huſband; and the mother, ſuch is the power of habit, is fooliſh enough to join her in teaſing him into an immediate compliance, though its conſequences muſt be equally fatal and ruinous to both of them. From hence it happens, that nothing is more common than to ſee the old father and mother reduced to the utmoſt indigence, and even begging about the ſtreets, while their unnatural daughters are in affluence; and we ourſelves have frequently been ſhown the eldeſt daughter parading it through the town in the greateſt ſplendor, while her mother and ſiſter followed her as ſervants, and made a melancholy part of her attendant train.

"The ſons, as ſoon as they are of an age to gain a livelihood, are turned out of the family, ſometimes with a ſmall preſent or portion, but more frequently without any thing to ſupport them; and thus reduced, they either endeavour to live by their labour, or, which is more uſual, go on board ſome trading veſſel as ſailors, or as ſervants, remaining abroad till they have got together ſome competency, and then return home to marry and to be henpecked. Some few there are who, taking advantage of the Turkiſh law, break through this whimſical cuſtom, who marry their calogrias, and retain to themſelves a competent proviſion: but theſe are accounted men of a ſingular and even criminal diſpoſition, and are hated and deſpiſed as conformiſts to Turkiſh manners, and deſerters of their native cuſtoms; ſo that we may ſuppoſe they are few indeed who have the boldneſs to depart from the manners of their country, to adopt the cuſtoms of their deteſted maſters, and to brave the contempt, the deriſion, and the hatred, of their neighbours and fellow-citizens.

"Of all theſe extraordinary particulars I was informed by the French conſul, a man of ſenſe and of indiſputable veracity, who had reſided in this iſland for ſeveral years, and who ſolemnly aſſured me that every circumſtance was true: but indeed our own obſervation left us without the leaſt room for doubt, and the ſingular appearance and deportment of the ladies fully evinced the truth of our friend's relation. In walking through the town, it is eaſy to perceive, from the whimſical manners of the female paſſengers, that the women, according to the vulgar phraſe, *wear the breeches*. They frequently ſtopped us in the ſtreets, examined our dreſs, interrogated us with a bold and manly air, laughed at our foreign garb and appearance; and ſhowed ſo little attention to that decent modeſty which is or ought to be the true characteriſtic of the ſex, that there is every reaſon to ſuppoſe they would, in ſpite of their haughtineſs, be the kindeſt ladies upon earth, if they were not ſtrictly watched by the Turks, who are here very numerous, and would be ready to puniſh any tranſgreſſion of their ungallant laws with arbitrary fines. But nature and native manners will often baffle the efforts even of tyranny. In all their cuſtoms theſe manly ladies ſeem to have changed ſexes with the men. The woman rides aſtride, the man ſits ſideways upon the horſe; nay, I have been aſſured that the huſband's diſtinguiſhing appellation is his wife's family name. The women have town and country houſes, in the management of which the huſband never dares interfere. Their gardens, their ſervants, are all their own; and the huſband, from every circumſtance of his behaviour, appears to be no other than his wife's firſt domeſtic, perpetually bound to her ſervice, and ſlave to her caprice. Hence it is that a tradition obtains in the country, that this iſland was formerly inhabited by Amazons; a tradition, however, founded upon no ancient hiſtory that I know of. Sappho indeed, the moſt renowned female that this iſland has ever produced, is ſaid to have had manly inclinations; in which, as Lucian informs us, ſhe did but conform with the ſingular manners of her countrywomen: but I do not find that the mode in which ſhe choſe to ſhow theſe inclinations is imitated by the preſent female inhabitants, who ſeem perfectly content with the dear prerogative of abſolute ſway, without endeavouring in any other particular to change the courſe of nature; yet will this circumſtance ſerve to ſhow, that the women of Leſbos had always ſomething peculiar, and even peculiarly maſculine, in their manners and propenſities, But be this as it may, it is certain that no country whatſoever can afford a more perfect idea of an Amazonian commonwealth, or better ſerve to render probable thoſe ancient relations which our manners would induce us to eſteem incredible, than this iſland of Metelin. Theſe lordly ladies are for the moſt part very handſome in ſpite of their dreſs, which is ſingular and diſadvantageous. Down to the girdle, which as in the old Grecian garb is raiſed far above what we uſually call the waiſt, they wear nothing but a ſhift of thin and tranſparent gauze, red, green, or brown, through which every thing is viſible, their breaſts only excepted, which they cover with a ſort of handkerchief; and this, as we were informed, the Turks have obliged them to wear, while they look upon it as an incumbrance, and as no inconſiderable portion of Turkiſh tyranny. Long ſleeves of the ſame thin material perfectly ſhow their arms even to the ſhoulder. Their principal ornaments are chains of pearl, to which they hang ſmall pieces of gold coin. Their eyes are large and fine; and the noſe, which we term Grecian, uſually prevails among them, as it does indeed among the women of all theſe iſlands. Their complexions are naturally fine; but they ſpoil them by paint, of which they make abundant uſe; and they disfigure their pretty faces by ſhaving the hinder part of the eyebrow, and replacing it with a ſtraight line of hair neatly applied with ſome ſort of gum, the brow being thus continued in a ſtraight and narrow line till it joins the hair on each ſide of their face. They are well made, of the middle ſize, and for the moſt part plump; but they are diſtinguiſhed by nothing ſo much and ſo univerſally as by a haughty, diſdainful, and ſupercilious air, with which they ſeem to look down upon all mankind as creatures of an inferior nature, born for their ſervice, and doomed to be their ſlaves; neither does this peculiarity of countenance in any degree diminiſh their natural beauty, but rather adds to it that ſort of bewitching attraction which the French call *piquant*."

His lordſhip has been at great pains to inveſtigate the origin of ſuch a ſingular cuſtom; but is unable to find any other example in hiſtory than that of the Lycians, who called themſelves by the names of their mothers, and not of their fathers. When aſked by their neighbours who they were? they deſcribed themſelves by their maternal genealogy. It a gentlewoman ſhould marry a ſlave, the children by that marriage were accounted noble; but ſhould the firſt man among them marry a foreign woman, the children would be accounted ignoble. This cuſtom is mentioned by ſeveral ancient authors. A difficulty of no little magnitude occurs, however, in accounting for the derivation of the inhabitants of Leſbos from the Lycians. This is ſolved in the following manner: In times of the moſt remote antiquity, the iſland of Leſbos was peopled by the Pelaſgi, who, under their leader Panthus, the ſon of Triopas king of Argos, firſt inhabited Leſbos: previous to that time they had dwelt in a certain part of Lycia which they had conquered; and in this country we may ſuppoſe they had learned the cuſtom in queſtion. But though this might readily be granted, as we know ſo little of the origin of ancient nations, yet the queſtion ſtill recurs, Whence did it originate among the Lycians? Here we are ſtill more difficulted than before; and the only thing we have to help us out is an obſcure tradition concerning Bellerophon, *viz.* that the hero having deſtroyed a boar which waſted the territory of Xanthus a city of Lycia, the inhabitants were ſo ungrateful as to return him no thanks for ſo great a favour; upon which, by his prayers, he cauſed the curſe of barrenneſs to fall upon them, but was at length prevailed upon, by the intreaties of the women, to intercede with his patron Neptune to pardon them. On this account it was decreed, that the people of Xanthus ſhould be called by the names of their mothers and not of their fathers. Plutarch relates alſo, that Bellerophon not only freed the Lycians from an invaſion of pirates, but from the Amazons alſo, whom he drove out of their country; "ſo that there may be ſome reaſon (ſays his Lordſhip) to ſuppoſe, that the Lycian women, by an intecrourſe with the Amazons, who had, it ſhould ſeem, dwelt among them, were already previouſly prepared for the introduction of theſe cuſtoms, which were finally eſtabliſhed in conſequence of their patriotic merit in deprecating the wrath of Bellerophon, and in averting its fatal conſequences."

This is the ſubſtance of what his Lordſhip advances to the origin of this extraordinary cuſtom. He owns, that the traces are very obſcure; and though he is conſcious that ſuch a ſpeculation may be liable to ridicule, and he is aware " of ſome objections not eaſy to be anſwered, the coincidence will notwithſtanding be allowed to be curious and very remarkable. The well known pertinacious adherence to ancient manners among the eaſtern nations, may in ſome meaſure excuſe our credulity; and we may ſtill add to our authority, by ſuppoſing that this ſame Xanthus may probably have given his name to the Lycian city of that denomination; and conſequently muſt have inhabited that very part of Lycia where, according to Plutarch, he is ſuppoſed more immediately to have flouriſhed."

METELLUS, the ſurname of the family of the Cæcilii at Rome, the moſt known of whom were ——A general who defeated the Achæans, took Thebes, and invaded Macedonia, &c.—Q. Cæcilius, who rendered himſelf illuſtrious by his ſucceſſes againſt Jugurtha the Numidian king, from which he was ſurnamed *Numidicus*.—Another who ſaved from the flames the palladium, when Veſta's temple was on fire. He was then high-prieſt. He loſt his ſight and one of his arms in the action; and the ſenate, to reward his zeal and piety, permitted him always to be drawn to the ſenate-houſe in a chariot, an honour which no one had ever before enjoyed. He alſo gained a great victory over the Carthaginians, &c.—Q. Cæcilius Celer, another who diſtinguiſhed himſelf by his ſpirited exertions againſt Cataline. He married the ſiſter of Clodius, who diſgraced him by her incontinence and laſciviouſneſs. He died 57 years before Chriſt. He was greatly lamented by Cicero, who ſhed tears at the loſs of one of his moſt faithful and valuable friends.—L. Cælius, a tribune in the civil wars of J. Cæſar and Pompey. He favoured the cauſe of Pompey, and oppoſed Cæſar when he entered Rome with a victorious army. He refuſed to open the gates of Saturn's temple, in which were depoſited great treaſures; upon which they were broke open by Cæſar, and Metellus retired when threatened with death.—Q. Cæcilius, a warlike general who conquered Crete and Macedonia, and was ſurnamed *Macedonicus*. He had four ſons, of which three were conſuls, and the other obtained a triumph, all during their father's lifetime.—A general of the Roman armies againſt the Sicilians and Carthaginians. Before he marched, he offered ſacrafices to all the gods except Veſta; for which neglect the goddeſs was ſo incenſed, that ſhe demanded the blood of his daughter Metella. When Metella was going to be immolated, the goddeſs placed a heifer in her place, and carried her to a temple at Lanuvium, of which ſhe became the prieſteſs.—Another, ſurnamed *Dalmaticus* from his conqueſt over Dalmatia, A. U. C. 634.—Cimber, one of the conſpirators againſt J. Cæſar. It was he who gave the ſignal to attack and murder the dictator in the ſenate-houſe.—Pius, a general in Spain, againſt Sertorius, on whoſe head he ſet a price of 100 talents and 20,000 acres of land.

METEMPSYCHOSIS, (formed of μετα "beyond," and εμψυχω "I animate or enliven"), in the ancient philoſophy, the paſſage or tranſmigration of the ſoul of a man, after death, into the body of ſome other animal.

Pythagoras and his followers held, that after death mens ſouls paſſed into other bodies, of this or that kind, according to the manner of life they had led. If they had been vicious, they were impriſoned in the bodies of miſerable beaſts, there to do penance for ſeveral ages; at the expiration whereof, they returned afreſh to animate men. But, if they lived virtuouſly, ſome happier brute, or even a human creature, was to be their lot.

What led Pythagoras into this opinion was the perſuaſion he had that the ſoul was not of a periſhable nature: whence he concluded that it muſt remove into ſome other body upon its abandoning this. Lucan treats this doctrine as a kind of officious lie, contrived to mitigate the apprehenſion of death, by perſuading men that they only changed their lodging and only ceaſed to live to begin a new life.

Reuchlin denies this doctrine; and maintains that the metempſychoſis of Pythagoras implied nothing more than a ſimilitude of manners, deſires, and ſtudies, formerly exiſting in ſome perſon deceaſed, and now revived in another alive. Thus when it was ſaid that Euphorbus was revived in Pythagoras, no more was meant than that the martial virtue which had ſhone in Euphorbus at the time of the Trojan war, was now, in ſome meaſure, revived in Pythagoras, by reaſon of the great reſpect he bore the *athletæ*. For thoſe people wondering how a philoſopher ſhould be ſo much taken with men of the ſword, he palliated the matter, by ſaying, that the ſoul of Euphorbus, *i. e.* his genius, diſpoſition, and inclinations, were revived in him. And this gave occaſion to the report, that Euphorbus's ſoul, who periſhed in the Trojan war, had tranſmigrated into Pythagoras.

Ficinus aſſerts, that what Plato ſpeaks of the migration of a human ſoul into a brute, is intended allegorically, and is to be underſtood only of the manners, affections, and habits, degenerated into a beaſtly nature by vice. Serranus, though he allows ſome force to this interpretation, yet inclines rather to underſtand the metempſychoſis of a reſurrection.

Pythagoras is ſaid to have borrowed the notion of a metempſychoſis from the Egyptians; others ſay, from the ancient Brachmans. It is ſtill retained among the Banians and other idolaters of India and China; and makes the principal foundation of their religion. So extremely are they bigotted to it, that they not only forbear eating any thing that has life, but many of them even refuſe to defend themſelves from wild beaſts. They burn no wood, leſt ſome little animalcule ſhould be in it; and are ſo very charitable, that they will redeem from the hands of ſtrangers any animals that they find ready to be killed. See PYTHAGOREANS.

METEMPTOSIS (from μετα "poſt," and πιπτω *cado* "I fall,") a term in chronology, expreſſing the ſolar equation, neceſſary to prevent the new moon from happening a day too late. By which it ſtands contradiſtinguiſhed from *proemptoſis*, which ſignifies the lunar equation, neceſſary to prevent the new moon from happening a day too ſoon.

The new moons running a little backwards, that is, coming a day too ſoon at the end of 312 years and a half; by the proemptoſis, a day is added every 300 years, and another every 2400 years: on the other hand, by the metemptoſis, a biſſextile is ſuppreſſed each 134 years; that is, three times in 400 years. Theſe alterations are never made but at the end of each century; that period being very remarkable, and rendering the practice of the calender eaſy.

There are three rules for making this addition or ſuppreſſion of the biſſextile day, and, by conſequence, for changing the index of the epacts. 1. When there is a metemptoſis without a proemptoſis, the next following, or lower index, muſt be taken. 2. When there is a proemptoſis without a metemptoſis, the next preceding or ſuperior index is to be taken. 3. When there are both a metemptoſis and a proemptoſis, or when there is neither the one nor the other, the ſame index is preſerved. Thus, in 1600, we had D: in 1700, by reaſon of the metemptoſis, C was taken; in 1800, there will be both a proemptoſis and a metemptoſis; ſo the ſame index will be retained. In 1900, there will be a metemptoſis again, when B will be taken; which will be preſerved in 2000, becauſe there will then be neither the one nor the other. This is as far as we need compute for it: But Clavius has calculated a cycle of 301800 years; at the end of which period, the ſame indices return in the ſame order. See EPACT.

METEOR, (by the Greeks called μετεωρα, q. d. *ſublima* or "high raiſed;" by the Latins *impreſſiones*, as making ſigns or impreſſions in the air), commonly denotes any bodies in the air that are of a flux or tranſitory nature. Hence it is extended to the phenomena of hail, rain, ſnow, thunder, &c.; but is moſt commonly confined to thoſe unuſual and fiery appearances named *falling-ſtars*, *ignes fatui*, *auroræ boreales*, &c. whether they appear at a great diſtance from the earth or not. See METEOROLOGY.

METEOROLOGICAL, ſomething belonging to meteors.

METEOROLOGICAL *Journal*, is a table recording the daily ſtate of the air, exhibited by the barometer, thermometer, hygrometer, anemometer, and other meteorological inſtruments. We have many journals of this kind, kept at the houſe of the Royal Society, and by different obſervers in other places, in the Philoſophical Tranſactions, the Memoirs of the Academy of Sciences, and ſimilar publications.

METEOROLOGY;

THAT ſcience which inveſtigates the phenomena of our atmoſphere* (commonly called *meteors*), giving an account of the circumſtances attending each, and explaining the cauſe from whence they ariſe.

1 Meteors, how divided.

In conſidering this ſcience, we find the objects of it naturally divided into two claſſes, *viz.* thoſe which riſe high in the heavens, ſeemingly without any connection with this earth; and others which are more particularly connected with the earth, or are perceptible only in the lower regions of the atmoſphere. The former, which may properly be called *celeſtial meteors*, are only three in number, *viz.* the large fire-balls, falling ſtars, and aurora borealis. The ſecond claſs is much more numerous; including the phenomena of the ordinary winds, rain, hail, ſnow, clouds and vapours of all kinds, thunder and lightning, hurricanes, whirlwinds, water-ſpouts, ignes fatui, and other wandering luminous appearances; not excepting the various changes of the atmoſphere itſelf, with regard to its ſpecific gravity, rarefaction, heat, and moiſture, as indicated by the barometer, thermometer, and hygrometer.

2 Difficulties attending the ſubject.

To treat of all theſe in a ſatisfactory manner, it is plain that we ought to have an intimate acquaintance with the conſtitution of the atmoſphere; with the nature of thoſe powerful agents by which it appears to be principally influenced, *viz.* fire, light, and electric fluid; and with their peculiar modes of operation and action upon one another and upon the atmoſphere, and this in every poſſible variety of circumſtances. Nor is even all this ſufficient: The various phenomena of rain, wind, ſnow, thunder, heat, cold, &c. are known to depend very much upon the ſituation of different places on the ſurface of the earth; and their occaſional variations are with great reaſon *ſuſpected* to proceed, partly at leaſt, from changes which take place in the bowels of the earth*: whence a meteorologiſt ought not only to be perfectly well acquainted with geography, but with mineralogy alſo; and that to an extent at which human knowledge will probably never arrive.

In a ſcience ſo very difficult, it is not to be ſuppoſed that any thing like a certain and eſtabliſhed theory can be laid down: our utmoſt knowledge in this reſpect goes no farther as yet than to the eſtabliſhment of a few facts; and in reaſoning even from theſe, we are involved every moment in queſtions which ſeem ſcarcely within the compaſs of human wiſdom to reſolve.

3 Cauſes probably concerned.

In conſidering the ſubject of meteorology, it will readily be admitted, that the whole atmoſpherical phenomena depend ſome how or other upon the action of the ſun upon the earth, and the annual and diurnal revolutions of the latter. As theſe cauſes, however, are always invariably the ſame, why do we not find the ſame regularity in meteors that we do in other phenomena of nature? The eclipſes of the ſun and moon, for inſtance, which depend on the different poſitions

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* See Atmoſphere.

* See Weather.

ſitions of the earth and moon with regard to the great luminary, are found to follow a certain and regular courſe; ſo that the very ſame eclipſes, both as to quantity and duration, which happened before will happen again. But with meteors the caſe is quite different. Moſt of the atmoſpherical phenomena are ſo various and uncertain, that no perſon can pretend to reduce them to any kind of rule. Every ſucceeding year, for inſtance, differs in a vaſt number of particulars from that which preceded it, even in ſuch as are the moſt ſimilar to one another. Sometimes we find a number of years ſucceſſively ſimilar to one another, and another ſet quite different taking place immediately after them; and ſome have even fancied that this ſucceſſion took place every 19 years, nearly the time of the revolution of the moon's nodes, though the obſervations on which this opinion is built are far from being ſufficient to eſtabliſh it; at any rate, the diſſimilarity between the phenomena of different years may ſufficiently warrant us to conclude, that other cauſes beſides the regular action of the ſun and revolution of the earth are concerned. Some of theſe cauſes may be ſuppoſed to be fermentations and other commotions within the bowels of the earth itſelf; but as all fermentation is a regular proceſs, and takes place only in certain circumſtances, of which heat is a very conſiderable one, why is there not annually a certain quantity of this fermentation excited, and why are not regular effects obſerved in proportion? It does not indeed appear, that the immenſe variety which occurs in meteorological appearances can by any means be accounted for but by the interference of ſome cauſes in their own nature *irregular*; that is, capable of ſuch endleſs variety, that no aſſignable ſpace of time is ſufficient to exhauſt it. Theſe cauſes as they cannot be proved to exiſt either on the ſurface of the earth or in its internal parts, muſt be ſought for in the celeſtial expanſe itſelf. Sir Iſaac Newton ſuppoſed the planets to be influenced by the comets, and that from the tails of the latter ſome of the finer parts of our atmoſphere were produced. He even ſuppoſed, that from theſe bodies a quantity of water, imagined to be waſted in the various operations of nature, might be ſupplied. But if it is not unreaſonable to ſuppoſe that *comets* anſwer ſome ſuch purpoſes in nature, it is as little unreaſonable to think that the *planets* may influence the atmoſpheres of one another. That this muſt be the caſe indeed is very probable, not only on account of the light they reflect npon one another, but alſo by reaſon of their ſpheres of mutual attraction, which extend an immenſe way, and are ſo powerful in the planets Jupiter and Saturn, that they diſturb the motions of each others ſatellites as they paſs. But beſides even theſe cauſes, if we allow them to be ſuch, there are others which take place in the immenſe void betwixt the celeſtial bodies, and which has with great impropriety been determined an abſolute vacuum. That changes do take place in this ſpace, is evident from what is related of the temporary diſappearance of ſome of the ſatellites of Saturn, and their ſudden re-appearance, without any perceptible change in our atmoſphere ſo as to affect our view of other celeſtial objects. It may appear ridiculous to think, that a change in ſuch diſtant regions ſhould have any influence upon the atmoſphere of the earth; but we muſt remember, that if the univerſe is connected together as one vaſt ſyſtem, which we have every reaſon to believe, it is as impoſſible that a change can take place in any part without affecting the whole in ſome degree, as it is impoſſible to change any part of a clock or watch without in ſome meaſure affecting the whole movement.

4
Some of them probably exiſt in the celeſtial expanſe;

But of all the changes which take place in the celeſtial regions, thoſe which affect the ſun ſeem moſt likely to produce changes in our atmoſphere, and to be the hidden cauſe of many meteorological phenomena. That the ſun is not exempt from thoſe changes, is evident from the ſpots which are always or for the moſt part to be ſeen on his diſk when viewed through a teleſcope. It has been obſerved in ſome years, that the ſun has ſeemed to loſe his influence, and even to the naked eye appeared much dimmer than uſual. In ſuch caſes it is impoſſible but our atmoſphere, and even the whole ſolar ſyſtem, muſt have been affected; and not only muſt the ſeaſons for the preſent time have felt the malign influence of thoſe ſpots, but the atmoſphere itſelf may have acquired ſuch a diſpoſition as to produce ſeaſons of a peculiar nature for a number of years afterwards. If it be true, according to the hypotheſis of ſome, that the ſun is ſupplied with fuel by comets falling into his body, it is plain that every new acceſſion of this kind muſt have a proportionable effect upon all the bodies expoſed to his light. If the comets do not perform any ſuch office, ſtill it is very probable that they anſwer ſome purpoſes to the planets, becauſe they are never ſeen without the planetary regions: and though their influence be not immediately perceptible, it is impoſſible to prove that they have none, nor indeed is it probable that they have not; for we are very certain, that the influence of any object extends as far as its light, and how much farther we cannot tell. Conſidering the matter in this view, therefore, there is not a ſpot which can obſcure the ſun, a comet that can appear in the celeſtial regions, a planet that can approach the earth, nor perhaps a belt or ſpot which can take place on Mars, Jupiter, or Saturn, which may not be productive of important changes in our atmoſphere, and affect the meteors produced by it in many different ways.

5
Or in the ſun.

It would no doubt be an error to have recourſe to ſo many obſcure cauſes, were there any plain and obvious ones from whence the phenomena could be deduced. But the endleſs variety of meteors which occur throughout every part of the globe, plainly ſhow that the cauſes, whatever they are, muſt be infinitely varied alſo. The principal one is no doubt the action of the ſun upon the earth and atmoſphere in its various poſitions: but this is regular; and, did nothing elſe interfere, would produce regular effects. Secondary cauſes probably are the action of the moon and planets: but theſe alſo are regular, though much more diverſified than the former: ſo that we are at laſt obliged to have recourſe to cauſes ſtill more obſcure and remote, as comets, ſpots on the ſun, and changes taking place in the etherial fluid which pervades the whole celeſtial expanſe. Theſe we muſt either aſſign as the remote cauſes of the phenomena of our atmoſphere,

6
Action of the ſun, moon, and planets, concerned.

ſphere, or admit others equally obſcure; or we muſt be contented to own our ignorance, as indeed muſt at all events be frequently the caſe.

But though, to ſatiſfy ourſelves, ſuch conjectures may occaſionally be indulged, it is not from them that we are to derive any of the regular phenomena of nature; for theſe are evidently owing to the ſettled and eſtabliſhed action of heat, light, and electric matter, which have already been enumerated as the great powers influencing, and indeed in a great meaſure forming, the ſubſtance of our atmoſphere. The moſt remarkable effects of theſe are,

7 Evaporation a principal cauſe of meteors.

I. *Evaporation.* This, which is the principal cauſe of almoſt all the meteors of our atmoſphere, may be reckoned in a more particular manner the effect of heat. Upon this principle it is explained under the article Chemistry, where vapour is ſhown to be a compound of water and fire; and ſuch it is ſuppoſed to be by M. de Luc, in his Treatiſe on Meteorology, as well as by other philoſophers of the higheſt rank.

8 Natural evaporation different from artificial.

In conſidering this operation, however, as carried on by nature, we will ſoon find, that it proceeds in a manner very different from what takes place in our chemical operations. In the latter, evaporation is merely the effect of heat; and the proceſs cannot go on without a conſiderable degree of it, eſpecially if the veſſel containing the fluid be cloſe. In the natural way, on the contrary, the proceſs goes on under almoſt every degree of cold we know; the vapours aſcend to an height which has never yet been determined; and, from the extreme cold which they ſuſtain, ſhow evidently that they are connected with our atmoſphere by means of ſome other agent beſides heat.

9 Dryneſs of the upper regions of the atmoſphere.

From the continual aſcent of vapour indeed, if the operations of nature were of the ſame kind with thoſe of art, the upper parts of our atmoſphere would be always involved in a fog, by reaſon of the condenſation of the vaſt quantity which continually aſcends thither: but ſo far is this from being the caſe, that in thoſe elevated regions to which the vapours continually aſcend, the air is much drier than at the ſurface of the ground. This was experienced by M. de Sauſſure and M. de Luc in their journeys up the Alps.

10 Surpriſing inſtances of this dryneſs.

The air was there found to be exceſſively dry, and evaporation to go on much more rapidly than below; ſo that the ſurface of their bodies was parched up, and an exceſſive thirſt took place by reaſon of the great abſorption of the moiſture. The ſame dryneſs was manifeſt by the hygrometer, which could ſcarce ever be brought to indicate any moiſture, even when our travellers were ſurrounded with clouds, hail, and rain. From many experiments, indeed, it is evident, that water, after being reduced into a ſtate of vapour, is capable of undergoing a certain change, by which it lays aſide its fluidity entirely, and even to appearance its ſpecific gravity; ſo that it becomes, as far as we can judge, a ſubſtance totally different from what it was before.

11 Water ſometimes changes its nature.

This may be underſtood from the common operation of ſlacking lime; for in that caſe, the water unites with the lime ſo intimately, that the whole aſſumes the form of a dry powder, extremely greedy of moiſture, and which cannot be reduced to its former ſtate of quicklime without undergoing a much greater degree of heat than the water by itſelf could bear. The ſame thing is manifeſt from mixing dry plaſter of Paris with water; for thus a vaſt quantity of the water is fixed, and becomes in a manner ſolid. A ſtill more remarkable inſtance is in ſending the ſteam of water over red-hot iron; for there the fluid unites in ſuch a manner with the metal, that it cannot be expelled from it even by the heat of a burning-glaſs. Other inſtances are mentioned under the article Water: here we are to conſider the changes which the element undergoes after being reduced to the ſtate of vapour.

12 Particular account of natural evaporation.

The firſt of theſe is, its aſſuming the appearance of ſmoke or fog when mixed with the common atmoſphere; which ſmoke, when examined by a microſcope, appears to be compoſed of an infinite number of ſpherules of water, hollow, and filled with a fluid ſpecifically lighter than air, by which means they aſcend in it. As long as the aqueous vapour retains this viſible form, it retains alſo its humidity, and will again become a liquid, and wet whatever comes in its way; and this the more readily, while it retains any ſenſible degree of heat. As the vapour cools in the atmoſphere, it gradually aſſumes an aerial ſtate, mixing itſelf with the air ſo as to be no longer diſtinguiſhable from it. In this ſtate the air itſelf does not by any means appear to become more moiſt, but continually drier the more water it receives. This, however paradoxical it may ſeem, is a certain fact: for in ſummer, though we are aſſured that evaporation goes on very rapidly from the ſurface both of the ſea and land, yet the air, ſo far from being moiſt, is much drier than at any other time; and yet we know that the whole quantity evaporated is ſome how or other received by the atmoſphere. After the water has attained to this ſtate, our inquiries concerning it muſt in a great meaſure ſtop. We know not now, whether it has the form of ſmall hollow ſpherules, or whether it really becomes part of the atmoſphere itſelf, and aſſumes the form of what we call *dephlogiſticated air.*

13 Is capable of being decompoſed.

From ſome experiments in which that kind of air is produced from water, we are certain, that part of this element is converted into air: but in theſe operations, the evaporation of the water is prevented by being carried on in cloſe veſſels; ſo that we cannot tell whether that which would be mere ſteam in the open air, becomes dephlogiſticated air in cloſe veſſels or not. From the immenſe waſte of dephlogiſticated air, indeed, and the vaſt quantity which always ſurrounds the earth, we may ſuſpect that the water, after undergoing the natural proceſs of evaporation, does really become changed into this aerial fluid; and thus we will have a more ample ſource of it than can be derived from vegetation, or any other cauſe with which we are yet acquainted.

14 Obſervations of M. de Luc.

On this ſubject M. de Luc has ſome very curious obſervations, built principally upon the new doctrine of the compoſition of water; which, though a poſition maintained by the antiphlogiſtians, is by no means inconſiſtent with the exiſtence of phlogiſton, but rather a proof of it. Our author firſt began to alter his ſentiments concerning the *aqueous* exiſtence of vapour in the atmoſphere, from the circumſtance already mentioned concerning the great *dryneſs* of the upper atmoſpherical regions already taken notice of.

A

A very remarkable inſtance of this was, that the ferule of his cane dropped off during his journey up one of the Alpine mountains, which he never had obſerved it to do before. It is obſerved likewiſe, that the air in theſe elevated regions is ſomewhat drier in the night than in the day-time; for which M. de Luc gives the following reaſon, viz. that the air on the plains being condenſed by the cold, the ſuperior air muſt ſubſide, and the air on the mountains of courſe be replaced by the drier air from above them; though he thinks that this dryneſs may alſo be imputed in part to ſome other cauſe. This increaſe of dryneſs in the night, however, ſeems leſs conſtant than that in the day-time. Our author has often arrived at the tops of mountains before ſun-riſe, and ſometimes found the graſs covered with dew; though he never had the good fortune to be able to determine the ſtate of the air for want of an hygrometer: nor indeed could the appearance of dew be any certain indication of the ſtate of the atmoſphere, there being ſtrong reaſons to believe, that dew is occaſioned in great meaſure by vegetables themſelves; for graſs, when covered with glaſs plates, was found to become moiſt as well as that which had been expoſed to the open air. In this caſe, the plates became moiſt both on the upper and under ſides; but when ſuſpended a foot above the ground, they were found to be covered with dew only on the upper part.

15 M. Sauſſure's method of accounting for the dryneſs of the air.

The dryneſs of the air on the tops of high mountains was otherwiſe accounted for by M. Sauſſure.—When on Mount Blanc, at the height of 7200 feet above the level of the ſea, he found, that from ſix in the evening till half paſt five the next morning, his hygrometer moved 21 degrees (the whole ſcale containing 100) towards dryneſs. But this he accounts for by ſaying, that from ſunriſe to three or four in the afternoon, the quantity of vapours in the neighbourhood of the earth is continually diminiſhing, becauſe they *aſcend* in the atmoſphere, either in virtue of their own levity, or by means of a vertical wind, which he ſuppoſes to be produced by the heat of the ſun; that, from the time juſt mentioned till next morning, their quantity increaſes in the lower ſtrata, becauſe the upper vapours re-deſcend in proportion as they condenſe; and that in the higher regions of the atmoſphere, the reverſe ought to be the caſe, as the upper ſtrata are then left drier by the previous deſcent of the vapours. This argument, however, is contradicted by M. Sauſſure himſelf in another part of his work; where he ſays, that in the middle of the day, when the ſun is hotteſt, the air in the neighbourhood of the earth contains really more *water* than it does at the moment when a refreſhing dew falls. It is beſides impoſſible that a *vertical* wind can ever be occaſioned by the heat of the ſun; for this produces only a general expanſion of the whole body of the atmoſphere, as a condenſation of it is occaſioned by the action of cold: neither could any conſiderable quantity of vapour (ſuppoſing with M. Sauſſure that it is a chemical ſolution of water in air) deſcend in the night time; for, according to him, this compound differs very little from common air in its capacity of being expanded and condenſed. Neither, according to M. Sauſſure himſelf, can any part of the water with which the air is combined deſcend at all, until ſome portion of the former becomes ſuperſaturated with it, that is, till it has received more than it can hold in ſolution. But if this ſhould happen to be the caſe, the ſuperfluous quantity would then appear in the form of a miſt or cloud, and the hygrometer would indicate extreme humidity; whereas the contrary indication conſtitutes the difficulty.

16 Inſufficient

17 Aerial vapour cannot be condenſed by cold.

It is beſides evident, from innumerable inſtances, that mere cold will not by any means occaſion the condenſation of aerial vapour. A moſt remarkable example of this is given by M. de Luc, in an account of a ſtorm in which he was involved on one of the Alps. "Though the hygrometer (ſays he) was within $33\frac{1}{2}$ degrees of extreme dryneſs, or $66\frac{1}{2}$ from extreme humidity, thick clouds formed around us, which obliged us to think of retreating: in a little time the ſummit of the mountain was ſurrounded by them: they ſpread and covered the whole horizon: a premature night ſurpriſed us in a very dangerous road; and we ſuffered one of the moſt violent tempeſts I ever experienced, of wind, rain, hail, and thunder. The ſtorm laſted great part of the night, and extended all over the neighbouring mountains and plains; and after it had ceaſed, the rain continued, with only a few intermiſſions, till next day at noon. In one of theſe intervals, I examined the hygrometer on the outſide of our cabin; it ſhowed only $1^\circ\frac{6}{10}$ more humidity than before; and even this increaſe was no more than what the difference of heat was capable of producing. Nevertheleſs, new clouds continually rolled around us; and the rain, which preſently began again, accompanied us as it were by fits to the bottom of the mountain. When arrived there, we ſaw the clouds diſperſe entirely. I obſerved the hygrometer again in the open air; and though the earth was all drenched with water, and the heat of the ſun much leſs, the hygrometer was $1^\circ\frac{7}{10}$ drier than it had been two days before, after a courſe of fine weather. Where was all this water, and all the ingredients of the ſtorm, while the hygrometer ſhowed ſuch a degree of dryneſs in the very ſtratum where it was formed?"

18 M. de Luc's definition of vapour.

M. de Luc adopts the opinion concerning vapour which has been publiſhed in this work, under the articles Chemistry, Evaporation, and many others, viz. that it is a combination of fire with water. By *vapour*, however, he does not mean the viſible ſteam iſſuing from heated liquids, but that inviſible and ſubtile fluid which is found to be formed even *in vacuo*, and which of conſequence diſproves the hypotheſis of thoſe who hold that vapour is a ſolution of water in air. Our author, however, gives a ſolution of the difference betwixt what he calls *fog* or *miſt* and vapour, which ſeems not founded upon any evident principle. According to him, this vapour cannot ſubſiſt unleſs the particles of water united to the fire be at a certain diſtance from one another. When this diſtance is leſſened, a decompoſition takes place by reaſon of the attraction of the aqueous particles to one another: and they then appear in their proper form of a liquid, the fire diſſipating itſelf through the atmoſphere. The ſmalleſt diſtance to which the particles can be brought without any decompoſition, varies according to the temperature; but is always conſtant in the ſame degree. When the thermometer ſtands at temperate, or thereabouts, watery vapours, compreſſed into the ſmalleſt ſpace they can bear, are found to have between $\frac{1}{10}$th and $\frac{1}{30}$th of the elaſticity of air; but have leſs than $\frac{1}{120}$th of its weight. If ſuch vapour, however, be mixed with air, the minimum diſtance is greatly increaſed, by reaſon of the interpoſition of aerial particles; and thus it can ſubſiſt under a much greater preſſure than it could otherwiſe endure. In the heat of boiling water they can, without any mixture of air, bear the preſſure of the atmoſphere: for ebullition, under any given preſſure, cannot take place until the vapour produced in the liquor has acquired a degree of expanſive force ſufficient to raiſe the liquor into bubbles under that preſſure; and as long as the vapour retains this heat, it muſt continue capable of reſiſting the ſame preſſure. As the heat abates, a decompoſition begins; hence the opaque ſteam over boiling water, which, by becoming vapour again by uniting with the fire it meets with in a large ſpace, is diffuſed by its expanſibility.

19 Evaporation of the clouds.

Thus, vapours are continually undergoing decompoſitions and new vaporifications. This evaporation of the clouds after they were once formed, M. de Luc obſerved very evidently; ſome parts being continually detached, and gradually diminiſhing and diſappearing while new ones are formed; ſo that the clouds do not continue the ſame for two moments together; and the evaporation goes on ſo faſt, that a cloud could not ſubſiſt without conſtant and large ſupplies.—Theſe phenomena appear to be independent of heat and cold; for ſometimes clouds form ſuddenly in the middle of a hot day; and after they have poured down their water, all is clear again: and ſometimes they evaporate after ſunſet, gradually vaniſhing in the calmeſt weather without any change of place.—The appearances are ſuch as would be produced by a large maſs of water in violent ebullition, ſuſpended inviſibly in the atmoſphere; and the ſimilarity of effect naturally points out an analogy in the cauſe; that is, a ſource of vapour in the atmoſphere itſelf. It is only when the vapour is produced too abundantly and too rapidly to be diſperſed by evaporation that rain is formed; the veſicles in this caſe running together, and the water falling to the lower part, as it does in ſoap-bubbles, till they become thin enough to burſt.

20 Remarks on M. De Luc's obſervations.

With regard to this explanation, however, though it may account for the artificial production and decompoſition of vapour, it does not ſeem to anſwer for that produced in the natural way. That the latter is certainly in a ſtate of dryneſs, cannot be denied; but it cannot be proved that ever any artificial ſteam is ſo, let the heat be what it will. Though the approach of the aqueous particles to one another, therefore, by a diminution of temperature, may occaſion the decompoſition of artificial ſteam, it does not ſeem to be ſo in the natural way; nor is there any ſource from which we can reaſonably infer a very great and ſudden acceſſion of vapour from the earth to the upper regions of the atmoſphere in particular places, which might increaſe the proximity of the aqueous particles, and thus bring on rain according to M. de Luc's hypotheſis. It muſt likewiſe be remembered, that, according to the doctrine upon which M. de Luc founds his ſyſtem, water, when decompoſed, is not converted into one ſpecies of air, but into two, viz. the dephlogiſticated and inflammable, each of which contains a quantity of undecompoſed water; ſo that there is ſtill ſome ambiguity in the experiments; and as the two ſhrink up into very little bulk by their union, there ſhould ſeem to be danger of producing vacuums of immenſe extent by the ſudden union of the two airs in the high atmoſpherical regions.—Theſe vacuums, were they to extend over the whole ſpace occupied by a large cloud, might occaſion dreadful concuſſions by the ruſhing in of the air to ſupply them: or even if we ſuppoſe them to be diſperſed interſtitially, they muſt certainly affect the barometer very greatly: which does not appear to be the caſe. M. Sauſſure, who paſſed ſeveral nights on one of the Alps, at the height of 10,578 feet above the level of the ſea, does not mention any conſiderable variation of the barometer, though he was frequently involved, during that time, in the moſt violent ſtorms of hail, wind, ſnow, thunder, and lightning. In the warm climates alſo, where we ſhould think that the vaſt deluges of rain would often ſink the barometer to an amazing degree, yet we ſeldom hear of any remarkable variation. M. de Prielong, in his account of Meteorological Obſervations made at Goree in 1787, informs us, that there were 16 or 18 hurricanes; and that the greater part of theſe raiſed the barometer from one-twelfth to a ſixth part of an inch; others ſunk it as much, and ſome did not at all affect it. Another cauſe muſt therefore be concerned, which diminiſhes the rarefaction, or condenſes the air as faſt, or nearly ſo, as the condenſation of the vapour would rarefy it: and that another cauſe really is concerned, we learn from M. Reynier, who has made a great number of obſervations upon the vapours formed on the Alps, and gives us the following account. "In the morning, the vapours condenſed by the coldneſs of the night riſe along the mountains in proportion as the ſun riſes above the horizon.—When the weather will be fine, they glide uniformly on the brink of the mountain, and riſe over it by a regular motion, ſomewhat ſlow. When rain impends, the motion is irregular: they are alternately attracted and repelled by the mountain, and riſe like elaſtic bodies rebounding. In a ſtormy ſeaſon, particularly when there will be hail, the motions are ſtill more rapid and irregular." "This obſervation (add the Monthly Reviewers, from whom the above quotation was taken) may be confirmed in the mountainous countries of Great Britain; we have ſeen it among the mountains of Cumberland, particularly in the neighbourhood of Keſwick. M. Reynier obſerves, and the obſervation is ſufficiently near the ſurface not to be overlooked, that the appearance is electrical."

21 M. Reynier's obſervations.

22 Conſiderations on the nature of the fluid into which water is reduced by evaporation.

Before we proceed to give any ſolution of the *decompoſition* of vapour, it will be neceſſary to conſider a little farther the nature of the fluid or fluids into which water is converted when it aſſumes a dry ſtate in the atmoſphere. In the experiments of Lavoiſier and others, it ſeems with great probability to be reduced into the two different kinds of air already mentioned; but M. de Luc does not think that the atmoſphere naturally contains any ſuch fluids. Air, when artificially decompoſed, does not contain inflammable, but phlogiſticated or mephitic, air, mixed in a certain proportion with the dephlogiſticated kind. Theſe have different ſpecific gravities; and our author is of opinion, that two fluids of this kind could not mingle uniformly with one another without ſeparating through time; and as the dephlogiſticated air has the greateſt ſpecific gravity, it thence follows, that the under parts of the atmoſphere ought to be almoſt entirely compoſed of that kind, and the upper ſtrata of the mephitic or inflammable kind. But this does not appear to be the caſe; ſo that M. de Luc concludes, that air is an homogeneous fluid, every particle being ſimilar to every other, and conſiſting of all the ingredients that we extract from the maſs, together, probably, with others yet unknown to us. Though a mixture of vital and mephitic air produces many of the effects of atmoſpheric air, we cannot thence conclude their abſolute identity: the one may ſuffer a decompoſition in order to the production of theſe effects, while the other produces them immediately. The mixture may ſupport life for a time, but will it equally maintain health alſo? Though mephitic air by the mixture of one-third of vital air is prevented from being immediately fatal, we are not authoriſed to conclude that it is altogether innocent. On the whole then, if it is not in the immediate product of evaporation that rain has its ſource; if the vapours change their nature in the atmoſphere, ſo as to be no longer ſenſible to the hygrometer or to the eye; if they do not become vapour again till clouds appear; and if, when the clouds are formed, no alteration is obſerved in the quality of the air; we muſt acknowledge it to be very probable, that the intermediate ſtate of vapour is no other than air; and that the clouds do not proceed from any diſtinct fluid in the atmoſphere, but from a decompoſition of a part of the air itſelf, perfectly ſimilar to the reſt."

This opinion of M. de Luc appears the more probable, that the two ingredients into which water is artificially reſolved, by the late experiments do not by any means re-compoſe atmoſpherical air by ſimple mixture; for theſe explode with extreme violence on the application of flame: the common atmoſphere, alſo, when decompoſed, does not reſolve itſelf into dephlogiſticated and inflammable air, but into the former, and what is called phlogiſticated or the mephitic kind, the difference of which in ſpecific gravity is much leſs than between dephlogiſticated and inflammable airs, though it is probable that even theſe are connected either by means of a chemical union, or by ſome other ingredient we do not yet know. By this union the qualities of both may be in ſome meaſure changed, and a third kind of ſubſtance formed, as neutral ſalts may be made out of acids and alkalies. This third ſubſtance, which we call the common atmoſphere, is proper for preſerving both animal and vegetable life, which neither of the two ingredients are capable of doing; for plants wither and die in dephlogiſticated air, and animals are ſuffocated in a moment by the mephitic kind; nor, indeed, do we know whether the dephlogiſticated kind be altogether proper for the ſuſtenance of animal life for any conſiderable length of time. It certainly will ſuſtain it much longer than an equal quantity of atmoſpherical air, even the pureſt we are acquainted with; but it is equally certain that animals confined in it die much ſooner than according to its apparent purity they ought to do. It is not an unreaſonable hypotheſis, therefore, that though water may be artificially ſeparated into the two fluids called dephlogiſticated and inflammable airs, yet in the natural way the decompoſition does not proceed beyond a certain point, which we may, in a ſubject of ſuch an obſcure nature, call a *chemical union*, or a ſtate in which the two ingredients exiſt, and are capable of being ſeparated when the air comes into contact with certain ſubſtances. Hence, when the atmoſphere is taken into the lungs of an animal, ſome of the dephlogiſticated part may enter the blood, and the phlogiſticated part combining more intimately with the reſt, may form fixed air or part of it appear in its proper form. In like manner, when the common atmoſphere comes in contact with a vegetable, it is poſſible that the phlogiſticated part may be abſorbed by it, and the dephlogiſticated part ſet free, which in the atmoſphere may form new combinations, &c.

23 Air and water convertible into each other.

Granting this to be the caſe, and we can ſcarcely hope for a more probable conjecture on the ſubject, the decompoſition of the vapour will be eaſily accounted for. If by any natural proceſs the water can be converted into air, and if the latter is only water partially decompoſed; then, by an inverſion of the proceſs, air may be inſtantly re-converted into water, and will become viſible in fog or miſt, or be condenſed into rain, conſiſting of greater or ſmaller drops, according to the degree to which this inverted proceſs is carried. With regard to the means uſed by nature for carrying on theſe two oppoſite proceſſes, we can ſay very little; becauſe the agents concerned in them are entirely beyond the reach of our ſenſes. From M. Reynier's obſervation, indeed, of the clouds being attracted by the hills, it would ſeem probable that electricity was ultimately concerned, but in what manner we cannot determine. On this hypotheſis, however, we may explain the phenomenon taken notice of by M. de Luc and others, viz. that even during the time of exceſſive rains the hygrometer ſhowed ſcarce any ſigns of moiſture, and that the clouds were in a conſtant ſtate of evaporation or diſſolution in the air. The hygrometer, we know, cannot ſhow ſigns of moiſture, unleſs it abſorbs it; and it cannot abſorb, unleſs the air around it really contains more vapour in an aqueous form than the hygrometer itſelf does. But in very elevated regions this can ſcarce ever be the caſe. So much of the preſſure of the atmoſphere is then taken off, that the water contained in any ſubſtance reſolves itſelf into vapour with the utmoſt facility. Hence bodies brought from the lower regions into the higher will undoubtedly part with a great deal of the moiſture they contained in the lower parts of the atmoſphere, and which was kept in it by the ſuperior preſſure of the atmoſphere in theſe parts. For the ſame reaſon, though the air in the upper regions ſhould be made ever ſo moiſt, a body ſuch as the hygrometer can never abſorb ſo much as it would otherwiſe do, becauſe the water in theſe regions has a natural tendency to fly away from it. It appears, however, that there was in reality *ſome* variation of the hygrometer, though ſmall; and had it been poſſible to conſtruct an hygrometer of materials found on the top of the mountain, which might be ſaid to be naturalized to the climate, the ſcale of variation might probably have been larger, though there is no reaſon to think that it ever would be ſo large as on the plain. For the ſame reaſon, as ſoon as the proceſs has been inverted, by which water was converted into air, the evaporation inſtantly takes place in the vapour that has been produced. We are to conſider, that the atmoſphere is never diſpoſed to let fall *the whole* of the vapour it contains, for this would amount almoſt to an annihilation of it. Both proceſſes go on at once; and it is only in particular parts that the reverſe proceſs takes place. Thus clouds are formed: but as theſe ſeldom continue ſtationary, they no ſooner come into a ſituation where the contrary operation is going on, than they begin to evaporate; and even in the very ſame place, as ſoon as the condenſing proceſs has ſtopped, the other begins; as we ſee that even in the moſt damp and moiſt weather there is a conſtant evaporation going on; ſo that during the very time that rain is falling, the atmoſphere is taking up what lies upon the ground.— Hence alſo we may ſee why the hygrometer indicated a greater degree of dryneſs in the night than in the day time, viz. becauſe the evaporation from the earth is leſs during the night than in the day time.

24 Electricity of the atmoſphere conſidered.

II. Having now in ſome meaſure explained the phenomena of natural evaporation, we muſt next conſider thoſe of the *Electricity* of the atmoſphere. Under the article Electricity, the nature of that fluid is ſo fully diſcuſſed, and its identity with the ſolar light rendered ſo probable, that there ſeems no farther occaſion for entering into ſpeculations upon the ſubject. We ſhall therefore, without taking any notice of the arguments of M. de Luc for its being a compound fluid, proceed to conſider, according to the principles laid down in that article, how far electricity is concerned in producing the phenomena of meteorology.

25 Different agents concerned in producing all meteors.

In this inquiry we muſt obſerve, that as none of the agents by which thoſe phenomena are produced can act by themſelves, but muſt always be aſſiſted by the reſt, ſo we are not to aſcribe any one phenomenon to the influence of a ſingle agent without the reſt.— Thus, though in evaporation heat is principally concerned, and though evaporation is the principal cauſe of the appearance of clouds, &c. yet we do not find that heat is the *ſole* cauſe of evaporation; neither is evaporation the ſole cauſe of the appearance of clouds. In like manner, though electricity is the principal cauſe of many of the more grand phenomena of nature, yet electricity does not act by itſelf, but in conjunction with aqueous vapours; and when the atmoſphere ceaſes to contain any of theſe vapours, it is highly probable that it ceaſes to manifeſt any of the common effects of electricity alſo.

26 Electricity of the earth explained.

The general electricity of the earth has, under the article Electricity, been ſhown to depend upon the abſorption of the rays of the ſun by the land and water, eſpecially by the latter. As this abſorption muſt undoubtedly be ſtrongeſt in thoſe places where the greateſt quantity of rays fall upon the ſurface, it follows, that the emiſſion muſt be greateſt where the feweſt are abſorbed; that is, at the poles. Hence, were there no obſtacles, the electrical fluid would iſſue forth in vaſt quantities at each pole, very little being emitted in the intermediate ſpaces. By reaſon of the reſiſtance made by the great body of the earth, and the immenſe fields of ſnow and ice with which the polar regions are conſtantly enveloped, and which are much leſs perfect conductors than liquid water, the electric fluid, once abſorbed, has no free paſſage through any particular part of the globe, and therefore forces out every where throughout the whole ſurface. This paſſage is facilitated by the moiſture contained in the atmoſphere; and thus the proceſſes of evaporation and electricity aſſiſt one another: for where the air has for a long time been very dry, we find that the electric fluid cannot readily paſs, and violent thunder and lightening, nay ſometimes earthquakes, are ready to enſue. Hence alſo the common obſervation relative to thunder, viz. that there is ſeldom much thunder when it begins to rain before the thunder comes on: The reaſon is, that the rain, being an excellent conductor, facilitates the paſſage of the electric matter through the air, and keeps up the equilibrium without any violence or exploſion.

As the electric matter gets out of the earth, it is naturally driven upwards to the higher parts of the atmoſphere, where it probably aſſiſts in the decompoſition of air, or reſolving air into water, as has been already ſaid. When clouds are formed, it preſſes ſtrongly upon them by reaſon of their conducting nature: and hence all clouds, whether high or low, are found to be electrified; as are likewiſe all fogs, of whatever kind. The fluid getting ſtill higher and higher, at laſt aſcends beyond the regions of our atmoſphere, into the unknown ſpaces which are the reſidence of thoſe firſt of all created agents which conduct the planets round the ſun, and act as the *primum mobile* of nature.

Thus there is a circulation in the electric fluid as there is in the water. It deſcends originally from the ſun; pervades the whole ſubſtance of the globe; and perſpiring, as it were, at every pore, aſcends beyond the clouds; and, paſſing the extreme boundaries of our atmoſphere, returns to the ſun from whence it came. As the ſphere of its action in returning, however, muſt always increaſe, it follows, that after it has got beyond the bounds of the atmoſphere, the ſigns of its action muſt continually become leſs and leſs, nay, moſt probably vaniſh entirely; becauſe it is there oppoſed by an immenſe quantity of ſimilar matter, acting in an oppoſite or different direction from itſelf.

27 How the electric matter is confined in the atmoſphere.

This laſt conſideration leads into a very curious ſpeculation, and in a very plauſible manner anſwers an objection, the force of which it would otherwiſe be very difficult to avoid. "If the electric fluid be no other than the light of the ſun abſorbed by the earth, and emitted from it again by innumerable ſmall vents, how comes it to paſs that it is not perpetually drained off from the upper regions as faſt as it arrives without ſhowing any ſign of being reſiſted. The phenomena of thunder, of rain, nay of every meteor, manifeſtly ſhow that it often meets with very great reſiſtance; but this could not happen, unleſs there was without the atmoſphere ſomething capable of reſiſting and counteracting the vehement impulſe of all the electric fluid with which the earth is filled. This reſiſtance is very evident: for if there were none, there could not be any accumulation of electricity in the upper regions of the atmoſphere, but a rarefaction in it would take place ſimilar to what there is of air in the ſame regions. But this is ſo far from being the caſe, that all the electrical phenomena are much ſtronger in the upper than in the lower regions."

28
Mr Morgan's ſolution controverted.

To ſolve this objection, Mr Morgan, in a late paper in the Philoſophical Tranſactions, ſuppoſes that an abſolute vacuum, ſuch as he imagines the celeſtial ſpaces to be, is abſolutely *impenetrable* by the electric fluid. But this ſeems not far from a contradiction. Sir Iſaac Newton imagined the celeſtial ſpaces to be void of all matter, on account of the apparent facility with which the planets move through them; and we ſee that the rays of light, the impulſe of which is accounted ſcarce any thing at all, do penetrate them. To ſuppoſe, indeed, that a mere non-entity can act either by reſiſtance or any way elſe, is an abſurdity. How can any perſon imagine, that a perfect vacuum, which even a feather by its weight can cauſe it pervade from one end to the other, ſhould be impenetrable by a flaſh of lightning? It is true, indeed, that from ſome experiments it is found, that when the air is exhauſted very perfectly from a receiver, we cannot force an electric ſpark through it. But this, ſo far from proving that there is *nothing* in the glaſs, plainly ſhows that there is *ſomething* in it which makes a greater reſiſtance than we can overcome: and it is very probable that this ſomething is no more than the electric fluid itſelf; for as we are very certain that the electric fluid can *impel*, ſo we are equally certain that it can *reſiſt*. The truth is, that it is not in our power to move this fluid at all but by leſſening in one part the reſiſtance it meets with; in which caſe it moves very freely of itſelf: juſt as we can move the air with great facility, provided we allow the reſt to follow; but if we attempt to puſh a quantity of air before us, without allowing any to follow it to ſupply the vacuity, we will meet with a moſt violent reſiſtance. In the caſe of electric fluid, we can make it circulate from one part of the earth to another by means of conductors: but we cannot force any part of it to a diſtance from the reſt, nor can we cauſe a ſmall quantity expel a large one from any place, otherwiſe than by breaking the equilibrium; in which caſe the quantity which follows is preciſely equal to that which went before. In the caſe of a perfect Torricellian vacuum, we cannot diſcharge a bottle through it, without ſetting in motion all that quantity which is contained in the glaſs, as well as all that is connected with it, which it ſeems is more than the power of any machine can do. In like manner, the atmoſphere of the earth being ſurrounded by an immenſe and inconceivable quantity of electric matter, it cannot eſcape without putting in motion a quantity of that matter equal to what goes out. But this quantity, upon the whole, can never be greater than that which the earth every moment abſorbs from the ſun. Were a greater quantity to iſſue forth, it would be reſiſted by all the reſt, even to the utmoſt boundaries of the univerſe; a power which no created being could overcome. As matters ſtand at preſent, the reſiſtance is inconceivably great: for from the laws of mechanics it is evident, that action cannot exiſt without re-action; ſo that where there is no reſiſtance, there can be no effort. In all caſes we ſee that where the electric matter has a good conductor, it moves ſilently, and without ſhowing any marks of power whatever. If it meets with a ſmall reſiſtance it makes a ſmall effort, and a greater one if a greater reſiſtance is made, and ſo in proportion. The violence with which this fluid acts in ſome caſes, ſhows the ſtrength of the reſiſtance to it all around; for, like other fluids, we are certain that this one alſo acts with equal force all around it, and the exploſion is always made at the leaſt reſiſting part. The electric fluid of the atmoſphere, therefore, is confined by a very great power, which it is not by any means able to overcome, but which yields in a certain degree to its impulſe every moment, in proportion to the freſh ſupplies yielded by it to the earth, and which ſupplies come every moment from the ſun.

29
Of heat and cold as agents.

III. Heat and cold are very powerful agents in producing various meteors: but theſe are only relatives, and different modifications of the ſame fluid; the former being its action from a centre, the latter its action from a circumference to a centre. Though we do not know what connection there is between heat, cold, and what we call electricity, yet we know that this laſt is very much affected by them; for heat makes bodies more pervious to electricity than otherwiſe they would be, and cold makes them leſs ſo.—Hence the moſt violent electrical phenomena are obſerved in hot countries; while in the colder regions thoſe which depend on a more moderate electrification, as auroræ boreales, are more frequent. The prevalence of heat and cold in particular places, however, depends upon circumſtances which are altogether unknown to us; and therefore we cannot inveſtigate the modes of their operation in ſuch a particular manner as could be wiſhed. From what has been already ſaid, however, about the nature of the different agents concerned in meteorology, both in this article and in other parts of the work, we may take the following view of the cauſes of meteors in general.

30
Particular explanation of meteors.

1. Evaporation, combined with electricity, produces all the phenomena of vapour, fog, clouds, rain, &c.; and according as theſe two are joined to certain degrees of heat or cold, they produce dew, hoar-froſt, rain, hail, or ſnow.

The phenomena of dew and hoar-froſt ſeem to proceed from a quantity of aqueous and undecompoſed vapour which always exiſts in the atmoſphere; and which, being raiſed by mere heat, is condenſed by mere cold, without undergoing that proceſs by which water is changed into air. Hence it both aſcends and deſcends; for if we cover a ſmall ſpace of ground with plates of glaſs, they will be wetted both above and below. The reaſon of this is, that the evaporation from the ground does not ſtop immediately after the air begins to cool, eſpecially if it be covered with any thing which prevents the acceſs of the cold air, as the glaſs plates do in this caſe. The cold air, therefore, acting upon the glaſs, condenſes the vapour below it, in the ſame manner that the head of a ſtill or the receiver of a retort condenſes the vapours which riſe from the matter to be diſtilled. If the cold be very intenſe, hoar-froſt appears inſtead of dew; which is nothing more than the dew frozen after it falls upon the ground, in the ſame manner that the vapour in a warm room congeals on the inſide of the windows in a froſty night. As this ſeems to be the whole proceſs, it has not been obſerved that any electricity is concerned in the production of dew.

When the vapour has been thoroughly decompoſed and become inviſible, it very frequently returns back to its priſtine ſtate, ſo far as to aſſume the appearance of miſt or fog. In this caſe, electricity appears evidently to be concerned; for Mr Cavallo has obſerved that all fogs are electrified. When the proceſs has advanced farther, and the water begins to collect into drops, the electricity is ſtill more remarkable; and it is with great reaſon ſuppoſed that it is by means of electrical repulſion that the drops of rain keep at a regular diſtance from one another. When the cold is intenſe and the electricity ſtrong, the drops of water are frozen, and hail is produced: but ſnow indicates a more moderate degree of electricity; and a very violent cold, accompanied with a ſtrongly electrical atmoſphere, produces that exceſſively diſagreeable vapour in the polar regions called *froſt-ſmoke*, which is a general congelation of all the aqueous moiſture contained in the atmoſphere.

2. By violent electricity alone are produced the phenomena of thunder, lightning, fire-balls, ignes fatui, and the aurora borealis. In the phenomena of thunder, evaporation and the other agents by which rain and hail are produced are alſo concerned; though electricity is moſt remarkably ſo and thunder and lightning of the moſt violent kind frequently occur without any rain. The ignis fatuus, aurora borealis, large fire-balls, and the ſmaller ones called falling-ſtars, ſeem to depend upon electricity alone, without any aid from evaporation, or from heat or cold. Aurora borealis, indeed, is moſt common in the northern and ſouthern parts of the world, where the cold is intenſe; though this ſeems to be owing, not to the cold, but to the natural emiſſion of the electrical fluid from the polar regions in much greater quantities than from others. The fire-balls commonly appear collected on the very extreme boundaries of the atmoſphere, where, from the violent reſiſtance already mentioned, the fluid is confined as it were in a concave ſhell, which it cannot by any means penetrate in great quantities in any particular place. Though theſe fire-balls, therefore, contain an immenſe quantity of this fluid, they can only proceed in an horizontal direction, and never fly perpendicularly up from the earth, as thoſe will ſometimes do which are formed nearer the ground. The ignis fatuus ſeems to depend on the ſtrong electricity of a certain portion of atmoſphere, the cauſe of which is not well underſtood.

3. By the action of heat and electricity combined, are produced the phenomena of hurricanes, whirlwinds, and water-ſpouts. It is not, indeed, known in what manner thoſe agents combine themſelves to produce ſuch tremendous effects; but it ſeems evident that electricity is concerned in them, as the ſea-water becomes unuſually clear before an hurricane, and many ſigns of electricity are likewiſe obſerved in the heavens.

4. The winds are ſuppoſed to proceed moſtly from the heat of the ſun rarifying the atmoſphere, and occaſioning a continual influx of freſh air to fill up the vacuum; but very violent winds are frequently obſerved where no ſuch cauſe can be ſuppoſed to exiſt.—Thus, on the tops of high mountains the winds are commonly very violent; and mountainous countries, eſpecially when cold, are for the moſt part alſo ſubject to high winds. As the tops of mountains, however, are known to be ſtrongly electrified by their attracting and repelling the clouds, we muſt ſuppoſe that this electricity has a conſiderable ſhare in producing the winds which are generally ſo violent on their tops.—This will appear the more probable, when we conſider that frequently ſtorms of wind, and thoſe of the moſt violent kind, ſeem to be brought along with clouds; as, for inſtance, that mentioned under the article Malta, in which a dreadful tempeſt, brought along with a cloud, almoſt deſtroyed the whole town.

31
Uſes of meteors.

Thus we have endeavoured to give a general ſketch of the doctrine of Meteorology: a more particular detail of the cauſes by which meteors are produced is given under the names of each of them as they occur in the order of the alphabet. With regard to their uſes, theſe of the more magnificent and tremendous kind ſeem to be deſtined to preſerve the balance of the electric fluid in the atmoſphere, the want of which would be productive of the moſt fatal effects to the world in general. The effects of the inferior ones are more confined, and are of uſe only to particular diſtricts, ſcarcely ever extending their influence over a whole country. Thus the clouds, which produce rain for the purpoſes of vegetation, do not extend themſelves over a whole country at once, but tranſitorily fly over different parts of it; ſo that when it is rain, for inſtance, in one place, it may be ſunſhine in another, thunder in a third, &c. It is, however, ſurpriſing to obſerve how equally theſe act over the whole of a very large tract of land; ſo that though there is never preciſely the ſame weather in two places twenty miles diſtant from one another, yet vegetation goes on without any perceptible difference in the one as well as the other; neither, unleſs there be ſome very remarkable difference in the weather of one year from that of another, will there be any perceptible difference in the crop. For a more particular inveſtigation of this point, however, ſee the articles Vegetation and Weather.

For the application of meteorology to the fore-knowledge of the weather, ſee the article Weather.

Meteoromancy.

METEOROMANCY, a ſpecies of divination by meteors, principally by lightning and thunder. This method of divination paſſed from the Tuſcans to the Romans, with whom, as Seneca informs us, it was held in high eſteem.

Meteſſib, Metheglin.

METESSIB, an officer of the eaſtern nations, who has the care and overſight of all the public weights and meaſures, and ſees that things are made juſtly according to them.

METHEGLIN, a ſpecies of mead; one of the moſt pleaſant and general drinks the northern parts of Europe afford, and much uſed among the ancient inhabitants: (See Mead). The word is Welſh, *meddyglin*, where it ſignifies the ſame.—There are divers ways of making it; one of the beſt whereof follows: Put as much new honey, naturally running from the comb, into ſpring-water, as that when the honey is thoroughly diſſolved an egg will not ſink to the bottom, but be juſt ſuſpended in it; boil this liquor for an hour or more, till ſuch time as the egg ſwim above the liquor about the breadth of a groat; when very cool, next morning it may be barrelled up; adding to each 15 gallons one ounce of ginger, as much of mace and cloves, and half as much cinnamon, all groſsly pounded; a ſpoonful of yeaſt may be alſo added at the bung-hole to promote the fermentation. When it has done working, it may be cloſely ſtopped up; and after it has ſtood a month, it ſhould be drawn off into bottles.

METHOD, the arrangement of our ideas in ſuch a regular order, that their mutual connection and dependence may be readily comprehended. See Logic, Part IV.

METHODISTS, in eccleſiaſtical hiſtory, is a denomination applied to different ſects, both Papiſts and Proteſtants.

I. The *Popiſh Methodiſts* were thoſe polemical doctors, of whom the moſt eminent aroſe in France towards the middle of the 17th century, in oppoſition to the Huguenots or Proteſtants. Thoſe Methodiſts, from their different manner of treating the controverſy with their opponents, may be divided into two claſſes. The one may comprehend thoſe doctors, whoſe method of diſputing with the Proteſtants was diſingenuous and unreaſonable, and who followed the examples of thoſe military chiefs, who ſhut up their troops in intrenchments and ſtrong holds, in order to cover them from the attacks of the enemy. Of this number were the Jeſuit Veron, who required the Proteſtants to prove the tenets of their church by plain paſſages of ſcripture, without being allowed the liberty of illuſtrating thoſe paſſages, reaſoning upon them, or drawing any concluſions from them; Nihuſius, an apoſtate from the Proteſtant religion; the two Walenburgs, and others, who confined themſelves to the buſineſs of anſwering objections and repelling attacks; and cardinal Richelieu, who confined the whole controverſy to the ſingle article of the divine inſtitution and authority of the church. The Methodiſts of the ſecond claſs were of opinion, that the moſt expedient manner of reducing the Proteſtants to ſilence, was not to attack them by piecemeal, but to overwhelm them at once, by the weight of ſome general principle or preſumption, ſome univerſal argument, which comprehended or might be applied to all the points conteſted between the two churches: thus imitating the conduct of thoſe military leaders who, inſtead of ſpending their time and ſtrength in ſieges and ſkirmiſhes, endeavoured to put an end to the war by a general and deciſive action. Theſe polemics reſted the defence of Popery upon preſcription; the wicked lives of Proteſtant princes who had left the church of Rome; the crime of religious ſchiſm; the variety of opinions among Proteſtants with regard to doctrine and diſcipline; and the uniformity of the tenets and worſhip of the church of Rome. To this claſs belong Nicolle the Janſeniſt doctor, the famous Boſſuet, &c.

II. The *Proteſtant Methodiſts* form a very conſiderable body in this country; The ſect was founded in the year 1729 by one Mr Morgan and Mr John Weſley. In the month of November that year, the latter being then fellow of Lincoln college, began to ſpend ſome evenings in reading the Greek New Teſtament, along with Charles Weſley ſtudent, Mr Morgan commoner of Chriſt church, and Mr Kirkham of Merton college. Next year two or three of the pupils of Mr John Weſley and one pupil of Mr Charles Weſley obtained leave to attend theſe meetings. Two years after they were joined by Mr Ingham of Queen's college, Mr Broughton of Exeter, and Mr James Hervey; and in 1735 they were joined by the celebrated Mr Whitefield, then in his 18th year.

At this time it is ſaid that the whole kingdom of England was tending faſt to infidelity. "It is come (ſays Biſhop Butler), I know not how, to be taken for granted by many perſons, that Chriſtianity is not ſo much as a ſubject of inquiry, but that it is now at length diſcovered to be fictitious; and accordingly they treat it as if in the preſent age this were an agreement among all people of diſcernment, and nothing remained but to ſet it up as a principal ſubject of mirth and ridicule, as it were by way of repriſals, for its having ſo long interrupted the pleaſures of the world." The Methodiſts are ſaid, with great probability, to have been very inſtrumental in ſtemming this torrent. They obtained their name from the exact regularity of their lives; which gave occaſion to a young gentleman of Chriſt-church to ſay, "Here is a new ſet of *Methodiſts* ſprung up;" alluding to a ſect of ancient phyſicians which went by that name. This extreme regularity, however ſoon brought a charge againſt them, perhaps not altogether without foundation, of being too ſcrupulous, and carrying their ſanctity to too great an height. In particular it was urged, that they laid too much ſtreſs upon the rubrics and canons of the church, inſiſted too much on obſerving the rules of the univerſity, and took the ſcriptures in too literal a ſenſe; and to the name of *Methodiſts* two others were quickly added, viz. thoſe of *Sacramentarians* and the *Godly club*.

The principal perſon in this club while in its infancy appears to have been Mr Morgan, and next to him Mr John Weſley. They viſited the ſick, and inſtituted a fund for the relief of the poor; and the better to accompliſh their benevolent deſigns, Mr Weſley abridged himſelf of all his ſuperfluities, and even of ſome of the neceſſaries of life; and by propoſing the ſcheme to ſome gentlemen, they quickly increaſed their funds to 80 l. *per annum*. This, which one ſhould have thought would have been attended with praiſe inſtead of cenſure, quickly drew upon them a kind of perſecution; ſome of the ſeniors of the univertſiy began to interfere, and it was reported "that the college cenſors were going to blow up the Godly Club *." They found themſelves, however, patroniſed and encouraged by ſome men eminent for their learning and virtue; ſo that the ſociety ſtill continued, though they had ſuffered a ſevere loſs in 1730 in the death of Mr Morgan, who had indeed been the founder of it. In the month of October 1735, John and Charles Weſley,

* See Weſley's Life, p. 105.

ley, Mr Ingham, and Mr Delamotte ſon to a merchant in London, embarked for Georgia along with Mr Oglethorpe, afterwards General Oglethorpe. The deſign of this voyage was to preach the goſpel to the Indians. By this time, however, it appears, that Mr Weſley had embraced ſuch notions as may without the leaſt breach of charity be accounted fanatical. Thus in a letter to his brother Samuel, he conjures him to baniſh from his ſchool "the claſſics with their poiſon, and to introduce inſtead of them ſuch Chriſtian authors as would work together with him in 'building up his flock in the knowledge and love of God."

During the voyage ſuch a profuſion of worſhip was obſerved, as we cannot help thinking favoured more of a Phariſaical than Chriſtian behaviour; an account of which, as a ſimilar ſtrictneſs would certainly be inculcated upon the diſciples, and conſequently muſt give a juſt idea of the principles of the early Methodiſts, we ſhall here tranſcribe from Mr Weſley's Life. "From four in the morning till five each of us uſed private prayer; from five to ſeven we read the Bible together, carefully comparing it (that we might not lean to our own underſtandings) with the writings of the earlieſt ages; at ſeven we breakfaſted; at eight were the public prayers; from nine to twelve learned the languages and inſtructed the children; at twelve we met to give an account to one another what we had done ſince our laſt meeting, and what we deſigned to do before our next; at one we dined; the time from dinner to four we ſpent in reading to thoſe of whom each of us had taken charge, or in ſpeaking to them ſeparately as need required; at four were the evening prayers, when either the ſecond leſſon was explained (as it always was in the morning), or the children were catechiſed and inſtructed before the congregation; from five to ſix we again uſed private prayer; from ſix to ſeven I read in our cabin to two or three of the paſſengers, of whom there were about 80 Engliſh on board, and each of my brethren to a few more in theirs; at ſeven I joined with the Germans in their public ſervice, while Mr Ingham was reading between decks to as many as deſired to hear; at eight we met again, to inſtruct and exhort one another; between nine and ten went to bed, when neither the roaring of the ſea nor the motion of the ſhip could take away the refreſhing ſleep which God gave us."

As they proceeded on their paſſage, this auſterity inſtead of being diminiſhed was increaſed. Mr Weſley diſcontinued the uſe of wine and fleſh; confining himſelf to vegetables, chiefly rice and biſcuit. He eat no ſupper; and his bed having been made wet by the ſea, he lay upon the floor, and ſlept ſoundly till morning. In his Journal he ſays, "I believe I ſhall not find it needful to go to bed, *as it is called*, any more;" but whether this was really done or not, we cannot ſay.

The miſſionaries, after their arrival, were at firſt very favourably received, but in a ſhort time loſt the affections of the people entirely. This was owing to the behaviour of Mr Weſley himſelf, who appeared not only capricious but frequently deſpotic. He particularly gave offence by inſiſting upon the baptiſm of children by immerſion; and his exceſſive auſterity with regard to himſelf did not tend to give his hearers any favourable opinion either of the ſuperior ſanctity or wiſdom of their teacher. At laſt, on account of a difference with Mr Cauſton the ſtore-keeper and chief magiſtrate of Savannah, which ended in a law-ſuit, he was obliged to return to England.

Thus the cauſe of Methodiſm ſeemed to be entirely loſt in Georgia. But Mr Weſley was ſoon ſucceeded by a more popular and ſucceſsful champion, *viz.* Mr George Whitefield; who having ſpent his time during the voyage in converting the ſoldiers with whom he ſailed, arrived at Savannah in Georgia on the 7th of May 1738. Here he was received by Mr Delamotte, was joined by ſeveral of Mr Weſley's hearers, and became intimate with ſome other miniſters. Mr Ingham had made ſome progreſs in converting a few runaway Creek Indians, who had a ſettlement about four miles from Savannah; but being obliged to return to England in a few months, this deſign was fruſtrated, and the Indians in a few years ſeparated. During the ſhort time that Mr Whitefield reſided at Savannah, he became extremely popular; and indeed the inſtances of his ſucceſs in the way of making converts are very ſurpriſing. However, he was obliged to return to England in the autumn of that year, that he might receive prieſts orders. On his return to America in October 1739, he landed at Philadelphia, and inſtantly began his ſpiritual labours as in other places; being attended with aſtoniſhing ſucceſs not only there but wherever he went. Paſſing through the colonies of Virginia, Maryland, North and South Carolina, the number of converts continually increaſed; but on his arrival at Savannah, he found the colony almoſt deſerted. He now reſumed the ſcheme he had formerly projected of building an orphan-houſe; and for this he made the firſt collection at Charleſton in South Carolina, amounting to about 70 l. ſterling. His zeal in the cauſe of religion, or of the colony, were not, however, ſufficient to procure him the favour of thoſe in power. On his return to Philadelphia, after a ſhort ſtay at Savannah, the churches were denied him; but he was made ample amends by the ſucceſs which attended his field preachings and private efforts. Religious ſocieties were every where ſet up, and many were converted with ſymptoms of enthuſiaſm, different according to their various tempers and conſtitutions. During this excurſion, he was ſo ſucceſsful in his collection for the orphan-houſe, that on his return to Savannah he brought along with him money and proviſions to the value of 500 l. ſterling.

The ſucceſs in Georgia was now greater than ever; but the many charities which it was neceſſary to ſupply, rendered it neceſſary in a ſhort time for him to undertake another journey to Charleſton. Here his principles met with the greateſt oppoſition. He had loſt the favour of the commiſſary by his field-preaching, and was denied the ſacrament. The oppoſition, however, was altogether fruitleſs: the number of converts increaſed wherever he went, and he now undertook a voyage to New England. In this place alſo the eſtabliſhed clergy were his enemies; but the uſual ſuccceſs attended his other endeavours, and procured 500 l. more for the uſe of the orphans in Georgia.

From the year 1741 to 1742 America was deprived of Mr Whitefield's preachings, he having ſpent that interval in England; but in 1744 he again ſet out for the weſtern continent. The remarkable ſucceſs which had hitherto attended his labours, now ſtirred up many opponents; and theſe had met with the greater ſucceſs, as none of the Methodiſt preachers whom he had left, were poſſeſſed of ſuch abilities, either to gain the favour of thoſe who heard them, or to defend their doctrines againſt objections. Mr Whitefield's ſucceſs however, was the ſame as before: he even found means to inſpire the military claſs with ſuch ſentiments of devotion, that Colonel Pepperell could not undertake his expedition againſt Louiſbourgh, without firſt conſulting Mr Whitefield; and great numbers of New-Englanders went volunteers, confident of victory, in conſequence of the diſcourſes of their teacher.

From the continent of America, Mr Whitefield took a voyage to the Bermuda iſlands: and here, as every where elſe, he met with the moſt ſurpriſing ſucceſs. Here, alſo, collections were made for the Orphan-houſe in Savannah, which were tranſmitted to that place.

Suppoſing it to be better for his cauſe to viſit different countries, than to take up a permanent reſidence in one, Mr Whitefield left Bermudas in a few months, and did not return to America till 1751, when the Orphan-houſe was found to be in a very flouriſhing ſituation. After a ſhort ſtay, he ſet ſail again for Britain. Here he remained two years, and then ſet out on another viſit to America, landing at Charleſtown on the 27th of May, 1754. His preſence conſtantly revived the ſpirits and cauſe of his party, and added to their numbers wherever he went. Next year he returned to England; but after labouring in the uſual manner, and meeting with the uſual ſucceſs there till the year 1763, he ſet ſail again for America, and arrived at Virginia in the latter end of Auguſt. He now viſited all the colonies, and found that great progreſs had been made in converting the Indians. On his arrival at Georgia, matters were found in a very flouriſhing ſituation, and he received the thanks of the Governor and principal people, for the great benefit he had been to the colony; which ſhows, that the ſtories, which had been ſo induſtriouſly propagated, concerning the avarice of him and other Methodiſt preachers, were, partly at leaſt, unfounded. In 1765, he returned to England; and in 1769, made his ſeventh and laſt voyage to America, landing at Charleſtown on the 30th of November, the ſame year. He was ſtill attended with the ſame ſucceſs; and indeed it is impoſſible to read, without admiration, an account of the efforts made by himſelf and Mr Weſley, to propagate their tenets in the different parts of the world.

For a very conſiderable time, Mr Whitefield was the only Methodiſt who paid any attention to America: and in that country he was more popular than even in Europe. Towards the end of his life, ſeveral Methodiſts, having emigrated from Britain, formed diſtinct ſocieties in New-York and Philadelphia.—— Theſe quickly increaſed in number; and about the time that the war with Britain began, their numbers amounted to about 3000 in Virginia, Maryland, New-York, and Pennſylvania. They would probably have increaſed much more, had it not been for the imprudence of ſome of their preachers, who introduced politics into their diſcourſes, and thus rendered themſelves obnoxious to the people among whom they lived. Among thoſe who hurt the cauſe in this manner, was Mr Weſley himſelf, who, by writing a piece intitled, *A Calm Addreſs to the American Colonies*, would, in all probability, have ruined it, had not a gentleman, with whom he was connected, deſtroyed or ſent back to England, the whole impreſſion, as ſoon as it arrived in America, ſo that its exiſtence was ſcarce known in that continent. At the concluſion of the war, Dr Coke, who, in 1776, had left a curacy in England, in order to join Mr Weſley, paid a viſit to his friends in America; though it had been imagined that a total ſeparation had taken place between the American and European Methodiſts. This breach was, however, made up by a manœuvre of Mr Weſley; for no ſooner had the Americans obtained their independence, than he, who had hitherto branded them with the name of *rebels*, ſent a congratulatory letter on their freedom, from the "State and the Hierarchy," and exhorting them to "ſtand faſt in that liberty with which God had ſo ſtrangely made them free." To ſhow his zeal in their ſervice ſtill farther, he gave ordination, by laying on of hands, to ſeveral preachers who were to embark for America, and conſecrated Dr Coke one of the biſhops of the Methodiſt Epiſcopal church in that country. He extracted alſo from the liturgy of the Engliſh church one for the American Methodiſts, taking particular care to expunge every expreſſion that had a particular reſpect to the regal authority.

Such proceedings in one who had formerly profeſſed ſuch extraordinary attachment to the Engliſh church, could not but require an apology; and this was accordingly made in a paſtoral letter tranſmitted to the American ſocieties, and addreſſed "To Dr Coke, Mr Aſtbury, and our brethren in North-America." In this letter, he makes the following defence of his conduct: "Lord King's account of the primitive church convinced me, many years ago, that biſhops and preſbyters are the ſame order, and conſequently have the ſame right to ordain. For many years I have been importuned, from time to time, to exerciſe this right, by ordaining part of our travelling preachers. But I have ſtill refuſed, not only for the ſake of peace, but becauſe I was determined, as little as poſſible, to violate the eſtabliſhed order of the national church, to which I belonged. But the caſe is widely different between England and North-America. Here there are biſhops who have a legal juriſdiction; in America there are none, neither any pariſh-miniſters: ſo that, for ſome hundred miles together, there is none either to baptize, or to adminiſter the Lord's ſupper. Here, therefore, my ſcruples are at an end; and I conceive myſelf at full liberty, as I violate no order, and invade no man's right, by appointing and ſending labourers into the harveſt. It has indeed been propoſed to deſire the Engliſh biſhops to ordain part of our preachers for America: but to this I object. 1. I deſired the biſhop of London to ordain only one, but could not prevail. 2. If they conſented, we know the ſlowneſs of their proceedings; but the matter admits of no delay. 3. if they would ordain them now, they would likewiſe expect to govern them; and how grievouſly would that entangle us. 4. As our American brethren are now totally diſentangled, both from the ſtate and the Engliſh hierarchy, we dare not entangle them again, either with the one or the other. They are now at full liberty ſimply to follow the ſcripture and the primitive church; and we judge it beſt, that they ſhould ſtand faſt in the liberty wherewith God has ſo ſtrangely made them free."

Dr Coke, on the conſecration of Mr Aſbury to the office of a biſhop, made another apology. "The church of England (ſays he), of which the ſociety of Methodiſts have till lately profeſſed themſelves a part, did, for many years, groan in America, under grievances of the heavieſt kind. Subjected to a hierarchy which weighs every thing in the ſcale of politics, its moſt important intereſts were repeatedly ſacrificed to the ſuppoſed advantages of England.——The churches were in general filled with the paraſites and bottle-companions of the rich and great. The humble and moſt importunate intreaties of the oppreſſed flocks, yea, the repreſentations of a general aſſembly itſelf, were contemned and deſpiſed. Every thing ſacred muſt bow down at the feet of a party; the holineſs and happineſs of mankind be ſacrificed to their views; and the drunkard, the fornicator, and the extortioner, triumphed over bleeding Zion, becauſe they were faithful abettors of the ruling powers. The memorable revolution has ſtruck off theſe intolerable fetters, and broken the antichriſtian union which before ſubſiſted between church and ſtate. And had there been no other advantage ariſing from that glorious epoch, this itſelf, I believe, would have made ample compenſation for all the calamities of the war; one happy conſequence of which was, the expulſion of moſt of thoſe hirelings, who "eat the fat, and clothed themſelves with the wool, but ſtrengthened not the diſeaſed," &c. The parochial churches in general being hereby vacant, our people were deprived of the ſacraments through the greateſt part of theſe ſtates, and continue ſo ſtill. What method can we take in ſo critical a juncture? God has given us ſufficient reſources in ourſelves; and after mature deliberation, we believe that we are called to draw them forth.

"But what right have you to ordain?" The ſame right as moſt of the churches in Chriſtendom; our ordination, in its loweſt view, being equal to any of the preſbyterian, as originating with three preſbyters of the church of England. "But what right have you to exerciſe the Epiſcopal office?" To me, the moſt manifeſt and clear. God has been pleaſed to raiſe up, by Mr Weſley, in America and Europe, a numerous ſociety, well known by the name of *Methodiſts*. The whole body have invariably eſteemed this man as their chief paſtor under Chriſt. He has conſtantly appointed all their religious officers, from the higheſt to the loweſt, by himſelf or his delegate. And we are fully perſuaded, there is no church-office which he judges expedient for the welfare of the people entruſted to his charge, but, as eſſential to his ſtation, he has power to ordain. "But, do you not break the ſucceſſion?" The uninterrupted ſucceſſion of biſhops is a point that has long been given up by the moſt able Proteſtant defenders of Epiſcopacy. Biſhop Hoadley himſelf, in his celebrated controverſy with Dr Calamy, allows it to be unneceſſary. His words are, 'To the 13th queſtion I anſwer, that I think not an uninterrupted line of ſucceſſion of regularly ordained biſhops neceſſary.' He alſo grants the authenticity of the anecdote given us by St Jerom, which informs us, that the church of Alexandria had no regular ſucceſſion from the time of St Mark the evangeliſt, the firſt biſhop of that church, to the time of Dionyſius, a ſpace of 200 years; but the college of preſbyters, on the death of a biſhop, elected another in his ſtead. We are alſo informed, from the epiſtle of St Clement to the Corinthians, written ſoon after the death of St Paul, a writer, whoſe works are next in precedence to the canon of ſcripture, and probably written by immediate inſpiration, that the church of Corinth was then governed only by a college of preſbyters. And from the epiſtle of Polycarp to the church of Philippi, written in 116, we alſo find, that the Chriſtian Philippians were then governed only by a college of Preſbyters. So that the primitive Chriſtians were ſo far from eſteeming the regular ſucceſſion as eſſential to the conſtitution of a Chriſtian church, that, in ſome inſtances, Epiſcopacy itſelf was wholly omitted."

Such was the defence urged by Mr Weſley for this extraordinary aſſumption of Epiſcopal powers: a conduct, however, of which he afterwards repented, as tending to make a final ſeparation betwixt his followers and the church of England. Yet it does not appear that this had any bad effect on the minds of his American brethren; for Dr Coke, on his arrival on the weſtern continent, found the ſocieties numerous and flouriſhing. His firſt efforts were directed againſt the ſlave-trade; and not only the abolition of that traffic, but the releaſe of all thoſe who were actually ſlaves at the time, ſeem to have been his favourite objects. By interfering in this matter, however, perhaps with too much zeal, he involved himſelf in danger. Some riots took place; and a lady offered the mob 50 guineas if they would give the Doctor 100 laſhes. This piece of diſcipline would have been inflicted, had it not been for the interpoſition of a ſturdy Colonel; and the Doctor had not only the ſatisfaction of eſcaping the intended puniſhment, but of ſeeing his doctrine ſo far attended to, that ſome ſlaves were emancipated.

Mr Hanſon, in his memoirs of Mr Weſley, obſerves, that "the coloniſts, in the infancy of Methodiſm, conducted themſelves with more propriety than the Engliſh. There was little or no perſecution, nor any thing like a riot, except in one or two inſtances, which have been mentioned as the conſequences of the animadverſions on ſlavery; and even theſe were productive of no miſchief. Not a creature was materially injured; no bones were broken, nor any lives loſt; which was not the caſe in this country. Here many thouſands of innocent people were ſubjected to the groſſeſt indignities, and ſeveral were eventually ſacrificed to the fury of their perſecutors.

"While we commend the Americans for their behaviour in oppoſition to the brutality of Engliſh mobs, it may be proper to inquire into the ſources of this diſtinction. Something of this may have ariſen from ſimilarity of ſentiment. The Americans from the firſt beginnings of colonization, had been accuſtomed to the doctrines of the old Puritans and Nonconformiſts, which, in many reſpects, have a near affinity to the Methodiſtic tenets. The origin of Methodiſm in America was ſeldom, if ever, attended, either under the diſcourſes of Mr Whitefield's or Mr Weſley's preachers, with thoſe ridiculous effects with which it was accompanied in theſe kingdoms. Moſt of the preachers who went over to the continent, having laboured for ſome years in Europe previous to their having croſſed the water, had exhauſted their wild-fire; ſo that their diſcourſes were more ſpiritual and rational than thoſe of the primitive Methodiſts. Another reaſon may be found in the education of the Americans. As a people, they are better cultivated than the body of the Engliſh; they are chiefly compoſed of merchants and a reſpectable yeomanry: and there is but a ſmall proportion of that claſs, ſo ſuperabundant here, which we diſtinguiſh by the name of *mob*.

"The only exceptions we have heard to their exemption from the extravagancies which in this country marked the infancy of Methodiſm, is a cuſtom they have introduced in Maryland and Virginia. Frequently, at the concluſion of a ſermon, the whole congregation begin to pray and to praiſe God aloud. The uproar which this muſt create may eaſily be conceived. Some, we are told, are great admirers of this ſpecies of enthuſiaſm, in which every man is his own miniſter, and one ſings and another prays, with the moſt diſcordant devotion. But we will not dignify ſuch indecency with ſuch a name: its proper appellation is, *fanaticiſm*. We hope, that, for the future, religion will never appear in this country under ſo odious a form; and greatly is it to be lamented, that, among the friends of Chriſtianity, any ſuch abſurdities ſhould ariſe, to furniſh infidels with occaſion of triumph."

Our author informs us, that the occupation of the Methodiſt preachers in America was very laborious. In the courſe of the day, they frequently rode 20 or 30 miles, preaching twice or thrice, and ſometimes to conſiderable congregations. Notwithſtanding this labour, however, few or none of them ever thought of returning to Britain. Several reaſons may be aſſigned for the pleaſure they took in this laborious exerciſe. "Their excurſions (ſays Mr Hanſon) through immenſe forreſts, abounding in trees of all ſorts and ſizes, were often highly romantic. Innumerable rivers and falls of water; viſtas opening to the view, in contraſt with the uncultivated wild; deer now ſhooting acroſs the road, and now ſcouring through the woods, while the eye was frequently relieved by the appearance of orchards and plantations, and the houſes of gentlemen and farmers peeping through the trees; formed a ſcenery ſo various and picturesque, as to produce a variety of reflection, and preſent, we will not ſay to a philoſophic eye, but to the mind of every reaſonable creature, the moſt ſublime and agreeable images.

"Their worſhip partook of the general ſimplicity. It was frequently conducted in the open air. The woods reſounded to the voice of the preacher, or to the ſinging of his numerous congregations; while their horſes, faſtened to the trees, formed a ſingular addition to the ſolemnity. It was indeed a ſtriking picture; and might naturally impreſs the mind with a retroſpect of the antediluvian days, when the hills and vallies reechoed the patriarchal devotions, and a Seth or an Enoch, in the ſhadow of a projecting rock, or beneath the foliage of ſome venerable oak, delivered his primeval lectures, and was a "preacher of righteouſneſs to the people."

The American hoſpitality is ſuppoſed by Mr Hanſon to have been another reaſon for the aſſiduity of the Methodiſt teachers, as well as the conſciouſneſs of being well employed, and the ſatisfaction reſulting from conſiderations of public utility. As many of the preachers were men of fervent piety, this reflection would have its full weight; and the inſtruction of the ignorant, and the reformation of the profligate, would be conſidered as the beſt recompence of their labours.—Spreading themſelves through the continent, they took in Nova-Scotia, Georgia, with the principal places in both Carolinas, Virginia, Maryland, Delaware, Pennſylvania, New-Jerſey, and New-York; numbering upwards of 43,000 members of their ſociety, excluſive of about 80 itinerants, and a conſiderable number of local preachers, who took no circuits, but aſſiſted occaſionally in the neighbourhood of their reſpective reſidence.

The large and expenſive buildings which the coloniſts have erected for public worſhip, almoſt exceed credibility; and ſeveral colleges are founded for the inſtruction of youth. How far the propoſed plan of uniting genuine religion and extenſive learning will be carried into execution, time only can diſcover. It muſt materially depend on the character of the preſidents and tutors, and the proviſion that ſhall be made for their ſupport. Men of real erudition, will never be procured at low ſalaries; and it is in vain to attempt eſtabliſhments of this ſort, without a liberal proviſion for the profeſſors in every branch of ſcience. Two of theſe places are called *Cokeſbury* and *Weſley Colleges*.—How they are endowed, or whether they propoſe to obtain authority to confer degrees, we are not informed. But perhaps they are rather ſchools than colleges; which indeed is a circumſtance to be wiſhed, as good grammar-ſchools are of the utmoſt ſervice to the progreſs of literature.

The great ſucceſs which attended the Methodiſt preachers in America, naturally determined Mr Weſley to try the Weſt-India iſlands. The Moravians had already attempted to eſtabliſh their principles in ſome of theſe iſlands; and in 1786, ſome preachers were ſent from the Methodiſts in England to the Weſt-Indies. In many of theſe they met with ſucceſs. Societies were formed in Barbadoes, St Vincent's, Dominica, St Chriſtopher's, Nevis, Antigua, St Euſtatius, Tortola, and St Croix, amounting in all to near 5000 perſons. At this time the whole number of Methodiſts in America and the Weſt-Indies, amounted to about 48,302. Theſe ſocieties conſiſt both of whites and blacks: on the continent they were moſtly whites, but in the iſlands negroes. "But it is to be obſerved, (ſays Mr Hanſon), that the ſubjection of the negroes, and the obedience in which they are trained, muſt inculcate a docility peculiarly favourable to the purpoſes of a miſſion." Some of the miſſionaries went alſo to St Vincent's, where they met with ſome ſucceſs, and have eſtabliſhed ſome ſchools, in which their children are carefully inſtructed in the principles of religion.

"In January, 1789, (ſays our author), Dr Coke paid a viſit to Jamaica, and gave them a few ſermons. As he made but a ſhort ſtay, it could hardly be conſidered as a fair trial. Should a miſſion be eſtabliſhed here, as well as in the other iſlands, which will probably be the caſe, it is hoped it will be the means of correcting one vice at leaſt, and that is duelling; a ſavage relict of Gothic barbarity, by which all the iſlands have for many years been diſtinguiſhed. Perhaps too, it will give ſome check to the ſpirit of luxury and diſſipation; and teach the planters, if it be found impracticable to emancipate their ſlaves, at leaſt to treat them with humanity."

It has been debated among the leading men of the Methodiſtical profeſſion, whether the cauſe might not be ſerved by ſending miſſionaries to the Eaſt-Indies and to Africa; but theſe projects were dropped, as there was no invitation, nor any proſpect of ſucceſs if it had been adopted. A miſſion has been formed to the new ſettlement called *Kentucky*, on the confines of the Indian territories, near the Miſſiſſippi. The danger of the miſſionaries at the time they undertook this ſervice, was certainly very great; yet ſuch was their zeal for the cauſe, that they voluntarily offered themſelves: but we are not yet informed what ſucceſs they have met with.

While Methodiſm was thus making rapid progreſs in America, its teachers were equally indefatigable in Britain. A moſt remarkable particular, however, occurs with regard to Mr Weſley himſelf; for though he had gone to Georgia, as has been already related, to convert the Indians to Chriſtianity, yet, on his return to England in 1738, he took it into his head that he, their teacher, was not yet converted: the reaſon was, that he had not the faith of aſſurance. This, however, was not long wanting. He arrived in England on the firſt day of February, and was bleſt with the aſſurance on the ſixth of March following. This was immediately announced to the public; and the conſequence, if we may believe him, was, that God then began to work by his miniſtry, which he had not done before. Being joined by one Kinchin, a fellow of Corpus, they travelled to Mancheſter, Holms Chapel, Newcaſtle in Staffordſhire, and other places, where they preached, exhorted, and converſed on religious ſubjects, in public houſes, ſtables, &c. ſometimes meeting with ſucceſs, and ſometimes not. During this peregrination, Mr Weſley certainly diſplayed a great deal of ſuperſtition, which we muſt undoubtedly ſuppoſe to have been communicated to his hearers, and to have cauſed them to act on many occaſions in a very ridiculous manner. An inſtance follows:—"The next day (ſays he), March 11th, we dined at Birmingham, and, ſoon after we left it, were reproved for our negligence there (in letting thoſe who attended us go without either exhortation or inſtruction), by a ſevere ſhower of hail!" About the latter end of March, or the beginning of April, he and his companion began to pray *extempore*, leaving off entirely the forms of the church of England, to which he had formerly been ſo devoted. The doctrine of inſtantaneous converſion, which his imagination had ſuggeſted to him as a work performed on himſelf, was greedily received by ſome of his hearers, and all the converts to the new doctrine confirmed themſelves, and contributed greatly to perſuade others by declarations of their *experiences*, as they called them: however, though a knowledge of the ſaving aſſurance had been given on March 6th, he does not date his converſion ſooner than May 24th, of the ſame year.

This new doctrine of an inſtantaneous, and in fact miraculous impulſe, though greatly reliſhed by the enthuſiaſtical part of the ſociety, was very much diſliked by others, particularly Mr Charles Weſley, his brother, who warned him of the miſchief he was doing; though he himſelf was ſoon converted, and, what is very aſtoniſhing, two days before John Weſley himſelf. The particulars related of theſe miraculous converſions are truly diſgraceful, and could not but bring into contempt the ſociety which conſiſted of ſuch enthuſiaſts. "Many (ſays Mr Hanſon) are repreſented as falling ſuddenly to the ground, in horror and agony not to be conceived, and riſing again with equal expreſſions of peace and conſolation." Their converſions were uſually attended with theſe violent ſymptoms; and, for ſeveral years, few meetings occurred where Mr Weſley preſided, without one or more inſtances of the ſame kind. It was not poſſible that ſuch tranſactions ſhould paſs without notice. The confuſion that too often prevailed, the emotions of the perſons affected, and the exultations of the reſt, which were ſeverally animadverted upon, gave great and general offence. Many inſiſted, that it muſt either be occaſioned by the heat of the rooms, and the agitation of the animal ſpirits under diſcourſes of the moſt alarming nature; or that it was mere artifice and hypocriſy.

In the mean time, two of the ſons of a Mrs Hutton, in London, happening to become converts to the new doctrine, this lady was ſo much offended, that ſhe wrote to Mr Samuel Weſley, informing him, that ſhe was of opinion his brother John had loſt his ſenſes; and requeſting, that the next time he came to his houſe, he, Mr Samuel, would either confine or convert him.—All that could be done, however, to prevent the progreſs of the new doctrine was inſufficient; and the firſt Methodiſt ſociety was formed in London, on the firſt of May, 1738, when about 50 agreed to meet together once a-week for free converſation, begun and ended with ſinging and prayer.

All this time, however, it ſeems that the converſion of Mr Weſley was far from being ſo complete as that of many of his hearers. He had preached and converted others, while he himſelf was abſolutely unconverted. The knowledge of the true ſaving faith was only revealed to him on the 6th of March, and he did not experience its power till the 24th of May; and even after this, his doubts and fears were ſtill ſo great, that on the 13th of June, he undertook a voyage to Germany, where, in the company of Count Zinzendorff, his faith ſeems to have been thoroughly confirmed.

On Mr Weſley's return, September 16th, 1738, he applied himſelf with the greateſt aſſiduity and ſucceſs, to the propagation of his doctrine. Multitudes of converts were made in various parts of the kingdom; and the reproaches poured upon him by his opponents, ſeemed to have rendered his zeal more fervent if poſſible than before. It is remarkable, however, that ſome of his old friends were now ſo much offended with his conduct or his principles, that they abſolutely refuſed to keep company with him. His original plan ſeems to have been, to make an union of clergymen, and diſſeminate his principles by their means. But in this he ſucceeded ſo ill, that in a letter written in 1742, he wiſhed for a clerical aſſiſtant, were he only in deacons orders: but adds, "I know of none ſuch, who is willing to caſt in his lot with us; and I ſcarce expect I ſhall, becauſe I know how faſt they are rivetted in the ſervice of the devil and the world before they leave the univerſity." Finding at laſt that nothing could be done with them, he was obliged to have recourſe to lay preachers; and eaſily ſelected thoſe who appeared to have the greateſt talents for prayer and exhortation in the private meetings appointed for that purpoſe. Thus he at once raiſed himſelf to be the head of a ſect; as the lay preachers willingly yielded obedience to him who had the advantages of ſuperior learning and abilities, and was beſides in orders as a clergyman; and this obedience he did not fail on every occaſion to exact.

If his doctrine had formerly given offence to the eſtabliſhed clergy, the appointment of lay preachers was reckoned much worſe; and their being appointed without any form of ordination whatever, which almoſt all of them were, ſubjected them to contempt and reproach, which their want of learning, and very often of natural abilities, did not contribute to remove. Thus finding the churches ſhut againſt him and his followers, he was obliged to preach in the fields, and made his firſt eſſay in this way on the ſecond of April, 1739, in the neighbourhood of Briſtol; Mr Whitefield having ſet him an example the day before.

The ſucceſs of thoſe ignorant and itinerant preachers, with their abſurd and uncharitable diſcourſes and behaviour, ſo provoked their adverſaries, that a perſecution was ſoon commenced againſt them. Mr Weſley himſelf was calumniated in the harſheſt manner, being ſometimes ſaid to be a Jeſuit, ſometimes an illiterate enthuſiaſt, as the people took it into their heads. Many pretended to anſwer him in writing, without being able to do ſo: the conſequence was that their deficiency of argument was ſupplied by invective, and the moſt ſcandalous performances made their appearance. Some of the Engliſh clergy ſo far forgot themſelves as to inſtigate the mob againſt them, and the moſt cruel outrages were committed upon them in various places. For ſome time the perſecuted party adhered to the doctrine of paſſive obedience and non-reſiſtance, which their inhuman adverſaries did not fail to take the advantage of.—The leſs they were oppoſed, the more inſolent they became. The Methodiſts were frequently in danger of their lives. Men, women with child, and even children, were knocked down and abuſed with the ſame undiſtinguiſhing fury. Houſes were ſtripped of their furniture, vaſt quantities of furniture carried off, feather-beds cut in pieces, and ſtrewed over the ſtreets, ſeveral reputable people were forced into the army, &c. To the diſgrace of magiſtracy alſo, it was found, that when application was made to the juſtices of the peace, redreſs was commonly denied; nor was a ſtop put to theſe ſhameful proceedings without a royal mandate for the purpoſe.

From the year 1738 to 1747, Mr Weſley and his itinerants were employed in various parts of England. In 1747, he went over to Dublin, where a ſociety had been formed by one Mr Williams a clergyman.—Here they proved ſo ſucceſsful, notwithſtanding the number of Papiſts, and the violence of their other opponents, that, in 1750, they had erected meeting-houſes in every part of the kingdom, and had formed 29 circuits, which employed 67 itinerants, beſides a conſiderable number of local preachers. An invitation was given to Mr Weſley, in 1751, to viſit Scotland, by an officer in quarters at Muſſelburgh. He accordingly took a journey thither the ſame year; but left the place, after preaching in it once or twice. In 1753, he returned to Scotland, and viſited Glaſgow. Societies were at length formed in that city, as well as at Edinburgh, Dundee, Aberdeen, Inverneſs, and a few other places: but his ſucceſs was by no means equal to what it had been in other parts; for in 1790, the number of circuits in Scotland was no more than eight, which were ſupplied by 20 itinerants.

Mr Whitefield, the other great labourer in the vineyard, was equally indefatigable, and probably more ſucceſsful than Mr Weſley. Before entering into orders, he had formed a ſociety of religious perſons at Glouceſter: here he preached his firſt ſermon on the Neceſſity and Benefit of Religious Society; here he became extremely popular, as well as at Briſtol and London, while preparing to ſet ſail for Georgia for the firſt time; and in all places to which he came, large collections were made for the poor.—He maintained the ſame doctrine with Mr Weſley as to the new birth; which likewiſe gave offence to the clergy when delivered by him, as it had done with Mr Weſley. In the various intervals of his voyages to America, he employed himſelf with the very ſame aſſiduity in Britain and in Ireland, which we have already taken notice of in the weſtern continent. His ſucceſs was every where prodigious. In 1741, he was invited to Scotland, and preached his firſt ſermon there at Dunfermline. From thence he went to Edinburgh, and preached in ſeveral of the eſtabliſhed churches, but differed with Meſſrs Ralph and Ebenezer Erſkines; ſo that he, as well as Mr Weſley, proved unſucceſsful in forming a coalition with any other religious party. In the private way, however, his ſucceſs was very conſiderable, at Edinburgh, Glaſgow, Aberdeen, Dundee, and other places. In 1742, he paid a ſecond viſit to Scotland, a third one in 1748. In 1751, he viſited Ireland for the firſt time; and preached to great multitudes, without being moleſted, even in places where others had been mobbed. From thence he returned to Scotland the ſame year, and ſpeaks in very favourable terms of the attention the people there paid to their bibles. In 1752 and 1753, he again viſited the ſame kingdom, and the laſt time diſtinguiſhed himſelf by preaching againſt the playhouſe in Glaſgow. In 1756 he returned; and, by his animated diſcourſes at Edinburgh againſt Popery and arbitrary power, was owned to have contributed very much to the increaſe of courage and loyalty in that country. Next year he again viſited the Scottiſh capital, during the time that the general aſſembly ſat, and his ſermons were attended by ſeveral of the members. At Glaſgow, he made a large collection for the poor of that city, and from thence took a

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voyage to Ireland. He was received with the uſual affection by the lower claſſes of Proteſtants; but the Popiſh rabble, exaſperated at his ſucceſs, almoſt murdered him with ſtones. After paſſing through a great part of Ireland, viſiting England and Wales, he paid another viſit to Scotland, where four clergymen now lent him their pulpits. His laſt viſit was in the ſummer of 1758, where his congregations were as large as ever; and it is to his endeavours principally that we are to aſcribe the great number of Methodiſt ſocieties now exiſting in Scotland.

History of Methodiſm, &c.

With regard to the religious principles of the Methodiſts, we cannot enter into any particular detail: neither indeed are there any doctrines peculiar to all included under that name, except the ſingle one of ſalvation by faith without works. In March, 1741, Mr Whitefield being returned to England, entirely ſeparated from Mr Weſley and his friends, "becauſe he did not hold the decrees." Here was the firſt breach, which warm men perſuaded Mr Whitefield to make, merely for a difference of opinion. Thoſe indeed who believed univerſal redemption, had no deſire at all to ſeparate: but thoſe who held particular redemption, would not hear of any accommodation, being determined to have no fellowſhip with men that "were in ſuch dangerous errors." So there were now two ſorts of Methodiſts ſo called; thoſe for particular, and thoſe for general, redemption.

Not many years paſſed, before William Cudworth and James Relly, ſeparated from Mr Whitefield.—Theſe were properly Antinomians, abſolutely avowed enemies to the law of God, which they never preached, or profeſſed to preach, but termed all *Legaliſts* who did. With them, preaching the law was an abomination. They had nothing to do with the law. They would preach Chriſt, as they called it; but without one word either of holineſs or good works. Yet theſe were ſtill denominated *Methodiſts*, although differing from Mr Whitefield, both in judgment and practice, abundantly more than Mr Whitefield did from Mr Weſley.

In the mean time, Mr Venn and Mr Romaine began to be ſpoken of: and not long after Mr Maden and Mr Berridge, with a few other clergymen, who, although they had no connection with each other, yet preaching ſalvation by faith, and endeavouring to live accordingly, to be Bible-Chriſtians, were ſoon included in the general name of *Methodiſts*. And ſo indeed were all others who preached ſalvation by faith, and appeared more ſerious than their neighbours. Some of theſe were quite regular in their manner of preaching: ſome were quite irregular, (though not by choice; but neceſſity was laid upon them, they muſt preach irregular, or not at all): and others were between both; regular in moſt, though not in all particulars.

In 1762, George Bell and a few other perſons began to ſpeak great words. In the latter end of the year they foretold that the world would be at an end on the 28th of February. Mr Weſley, with whom they were then connected, withſtood them both in public and private. This they would not endure; ſo, in January and February, 1763, they ſeparated from him, under the care of Mr Maxfield, one of Mr Weſley's preachers. But ſtill Mr Maxfield and his adherents, even the wildeſt enthuſiaſts among them, go under the general name of *Methodiſts*, and ſo bring a ſcandal upon thoſe with whom they have no connection.

At preſent, thoſe who remain with Mr Weſley are moſtly Church-of-England men. They love her articles, her homilies, her liturgy, her diſcipline, and unwillingly vary from it in any inſtance. Meantime all who preach among them declare, *we are all by nature children of wrath*, but *by grace we are ſaved through faith*; ſaved from both the guilt and from the power of ſin. They endeavour to live according to what they preach, to be plain Bible-Chriſtians; and they meet together at convenient times, to encourage one another therein.——They tenderly love many that are Calviniſts, though they do not love their opinions: yea, they love the Antinomians themſelves; but it is with a love of compaſſion only, for they hate their doctrines with a perfect hatred: they abhor them as they do hell-fire: being convinced nothing can ſo effectually deſtroy all faith, all holineſs, and all good works.

We ſhall conclude this article with the words of Mr Hanſon, which muſt certainly be accounted juſt, whatever objections may be made to ſome parts of the principles or behaviour of the Methodiſts. "If they poſſeſs not much knowledge, which, however, we do not know to be the caſe, it is at leaſt certain, they are not deficient in zeal: and without any paſſionate deſire to imitate their example, we may at leaſt commend their endeavous for the general good. Every good man will contemplate with pleaſure the operation of the ſpirit of reformation, whether foreign or domeſtic; and will rejoice in every attempt to propagate Chriſtianity in the barbarous parts of the world: an attempt which, if in any tolerable degree ſucceſsful, will do infinitely more for their civilization and happineſs, than all the united energies of thoſe boaſted benefactors of mankind, the philoſophic infidels."

Methodiſts

Methodius.

METHODISTS (*Methodici*), in the hiſtory of medicine, a ſect of ancient phyſicians, who reduced the whole art of healing to a few common principles or appearances. The Methodiſts were the followers of Theſſalus; whence they were alſo called *Theſſalici*.—They were ſtrenuouſly oppoſed by Galen in ſeveral of his writings; who ſcrupled not to aſſert, that the methodical hereſy ruined every thing that was good in the art.

Quincy miſtakenly uſes *Methodiſts (Methodici)*, for thoſe phyſicians who adhere to the doctrine of Galen, and the ſchools; and who cure with bleeding, purges, &c. duly applied according to the ſymptoms, circumſtances, &c. in oppoſition to empirics and chemiſts, who uſe violent medicines, and pretended ſecrets or noſtrums.

METHODIUS, a father of the church, biſhop of Olympus or Patara in Lycia, and afterwards of Tyre in Paleſtine, ſuffered martyrdom at Chalcis in Greece towards the end of Diocleſian's perſecution in the year 302. He compoſed many works in a clear and elaborate ſtyle, which were extant in Jerome's time. Father Combeſis collected ſeveral conſiderable fragments of this writer, cited by Epiphanius, Photius, and others; and printed them with notes of his own, together with the works of Amphilochius, and Andreas Cretenſis, in folio, Paris, 1644.

METHUSELAH, the ſon of Enoch, and father of Lamech, was born in the year of the world 687, begat Lamech in 874, and died in 1656, being the very year of the deluge, at the age of 969, which is the greateſt age that has been attained to by any mortal man upon earth (Gen. v. 21, 22, &c.) According to the text of the ſeptuagint, Methuſelah muſt have lived 14 years after the deluge; and according to other copies, he died ſix years before it: but it is generally agreed on, that theſe copies, as well as the ſeptuagint, are corrupted in this place.

METHYMNA (anc. geog.), a town of the iſland of Leſbos. It was the ſecond city of the iſland in greatneſs, population, and opulence. Its territory was fruitful, and the wines it produced excellent. It was the native place of Theophraſtus, and of Arion the muſician. When the whole iſland of Leſbos revolted from the power of the Athenians, Methymna alone remained firm to its ancient allies.

METIUS (James), of Alcmaer, in Holland, the inventor of teleſcopes with glaſſes, one of which he preſented to the States-General in 1609. Tubes, extended, by uniting them, to a great length, were known to the ancients; but Metius was the firſt who added glaſſes, and he was indebted to chance for the diſcovery: he had frequently obſerved ſome ſchool-boys playing upon the ice, who made uſe of their copy books rolled up in the ſhape of tubes, to look at one another, to which they ſometimes added pieces of ice at each end, to view diſtant objects: this led him to the invention of optic glaſſes.

METO, a famous mathematician of Athens, 432 B. C. publiſhed his *Enneadecaterides*, that is, his "Cycle of Nineteen Years," by which he endeavoured to adjuſt the courſe of the ſun to that of the moon, and to make the ſolar and lunar years begin at the ſame point of time.

METŒCI, a name given by the Athenians to ſuch as had their fixed habitations in Attica, tho' foreigners by birth. The *metœci* were admitted by the council of Areopagus, and entered in the public regiſter. They differed both from the πολιται and Ξενοι; becauſe the *politæ*, or "citizens," were freemen of Athens, and the *xeni*, or "ſtrangers," had lodgings only for a ſhort time; whereas the *metœci*, though not freemen of Athens, conſtantly reſided upon the ſpot whether they had removed.

METONYMY, in rhetoric, is a trope in which one name is put for another, on account of the near relation there is between them. See ORATORY, nº 51.

METOPE, in architecture, is the interval or ſquare ſpace between the triglyphs of the Doric freeze, which among the ancients uſed to be painted or adorned with carved work, repreſenting the heads of oxen or utenſils uſed in ſacrifices.

METOPOSCOPY, the pretended art of knowing a perſon's diſpoſition and manners by viewing the traces and lines in the face. Siro Spontoni, who has written expreſsly on metopoſcopy, ſays, that ſeven lines are examined in the forehead, and that each line is conſidered as having its particular planet; the firſt is the line of Saturn, the ſecond of Jupiter, the third of Mars, &c. Metopoſcopy is only a branch of phyſiognomy, which founds its conjectures on all the parts of the body.

METRE, μετρον, in poetry, a ſyſtem of feet of a juſt length.

The different metres in poetry, are the different manners of ordering and combining the quantities, or the long and ſhort ſyllables: thus hexameter, pentameter, iambic, ſapphic verſes, &c. conſiſt of different metres or meaſures. See HEXAMETER.

In Engliſh verſes, the metres are extremely various and arbitrary, every poet being at liberty to introduce any new form that he pleaſes. The moſt uſual are the heroic, generally conſiſting of five long and five ſhort ſyllables, and verſes of four feet, and three feet, and a cæſura or ſingle ſyllable.

The ancients, by variouſly combining and tranſpoſing their quantities, made a vaſt variety of different meaſures, by forming ſpondees, &c. of different feet. See POETRY.

METRETES, a Grecian meaſure, containing ſomething more than nine Engliſh gallons. See MEASURE.

METRICAL VERSES, are thoſe conſiſting of a determinate number of long and ſhort ſyllables; as thoſe of the Greek and Latin poets. Capellus obſerves, that the genius of the Hebrew languages is incompatible with metrical poetry.

METRODORUS, a Greek phyſician, born at Chios, was the diſciple of Democritus the philoſopher, and the maſter of Hippocrates the phyſician, and Anaxarchus the philoſopher. He maintained, that the univerſe is infinite and eternal: but his works are loſt. He lived about 444 B. C.

METROCOMIA (from μητηρ *mother*, and κωμη *town or village)*, a term in the ancient church-hiſtory, ſignifying "a borough or village that had other villages under its juriſdiction." What a metropolis was among cities, a *metrocomia* was among country towns. The ancient *metrocomiæ* had each its choriepiſcopus or rural dean, and here was his ſee or reſidence. See METROPOLIS and CHORIEPISCOPUS.

METRONOMII, the name given by the Athenians to five officers in the city and ten in the *piræus;* whoſe duty it was to inſpect all ſorts of meaſures, except thoſe of corn. The *piræus* was the greateſt mart in Attica.

METROPOLIS (from μητηρ *mother*, and πολις *city)*, the capital of a country or province; or the principal city, and as it were the mother of all the reſt.

The term METROPOLIS is alſo applied to archiepiſcopal churches, and ſometimes to the principal or mother-church of a city. The Roman empire having been divided into 13 dioceſes and 120 provinces, each dioceſe and each province had its metropolis or capital city, where the proconſul had his reſidence. To this civil diviſion the eccleſiaſtical was afterwards adapted, and the biſhop of the capital city had the direction of affairs, and the pre-eminence over all the biſhops of the province. His reſidence in the metropolis gave him the title of *metropolitan*. This erection of metropolitans is referred to the end of the third century, and was confirmed by the council of Nice.

A metropolitan has the privilege of ordaining his ſuffragans; and appeals from ſentences paſſed by the ſuffragans are preferred to the metropolitan.

METROPOLIS (anc. geog.), a town of Acarnania, a little to the ſouth of Stratos. Another, of Lydia; ſituated between Colophon and Priene, near the Cayſter.—A third of Phrygia; ſacred to the mother of the gods, who was here worſhipped.—A fourth Metropolis of Eſtiotis, a diſtrict in Theſſaly, to the eaſt of Gomphi, and the laſt town of that diſtrict. *Metropolitæ*, the people.

METULUM (anc. geog.), a conſiderable city of Liburnia, at the ſiege of which Octavius Cæſar was wounded. Said to be the metropolis, and ſituated on two eminences, interſected by a valley (Appian.) Now generally thought to be *Metling* in Carniola. E. Long. 16. N. Lat. 46. 5.

METZ, an ancient, large, and ſtrong town of France, and capital of the territory of Metz, with a citadel, a parliament, and a biſhop's ſee, whoſe biſhop aſſumes the title of a prince of the empire. The cathedral church is one of the fineſt in Europe, and the ſquare called *[illegible]* and the houſe of the governor, are worth ſeeing. The Jews live in a part of the town by themſelves, where they have a ſynagogue. The ſweetmeats they make here are in high eſteem. It is ſeated at the confluence of the rivers Moſelle and Seille. E. Long. 6. 16. N. Lat. 49. 7.

METZU (Gabriel), an eminent painter, was born at Leyden, 1615. His ſubjects were uſually taken from low life; but they were all deſigned after nature, and ſurpriſingly well repreſented; ſuch as women ſelling fiſh, fowls, or hares; ſick perſons attended by the doctor; chemiſts in their laboratories; dead game, painters rooms, ſhops, and drawing ſchools hung with prints and pictures; all which ſubjects he compoſed well, and finiſhed them with extreme neatneſs, as he likewiſe did his portraits. He ſpent a great deal of time on his pictures, which has occaſioned their ſcarcity and dearneſs at this time: and beſides, it is confidently ſaid, the Dutch prevent their being carried out of their own country, as much as poſſible. So that thoſe paintings of Metzu, which are ſometimes ſeen in the collections of other kingdoms, are either obtained by chance, or purchaſed at large prices. Though it ought alſo to be remembered, that the value ſet upon the works of this maſter throughout Holland and Flanders, has induced ſeveral painters to endeavour at imitating and copying his works, which having gradually circulated abroad, and being a little mellowed by time, are now called originals. He died in 1658.

MEVANIA (anc. geog.), a town of the Ciſappenine Umbria; ſeated at the confluence of the Tina and Clitumnus, on the Via Flaminia, famous for its herds of white cattle brought up there for ſacrifice; the white colour ſaid to be owing to the waters of the Clitumnus (Virgil). Mevania was the country of Propertius, *Mevanates* the people. Now ſaid to be *Bevagna*, in the territory of the Pope.

MEULEN (Anthony Francis Vander), painter of battles, &c. was born at Bruſſels in 1634; and was a diſciple of Peter Sneyers, a battle-painter of conſiderable note. Some of his compoſitions happening to be carried to Paris, were ſhown to M. Colbert; who ſoon diſcerned the abilities of Vander Meulen, and by his generous offers induced him to leave his native city, and ſettle at Paris. Here he was employed by Louis XIV. and had an appointment of 2000 livres penſion, beſides being paid for his work. He attended that monarch in moſt of his expeditions in the field, and deſigned on the ſpot the ſieges, attacks, encampments, and marches, of the king's armies, alſo the views of thoſe cities and towns memorable by any degree of ſucceſs; and from thoſe ſketches he compoſed the paintings, which were intended to perpetuate the remembrance of thoſe military exploits. He died in 1690. The principal works of this maſter are at Verſailles and Marli; but many of his eaſel pictures are diſperſed through England, France, and Flanders.

MEURSIUS (John), a learned and laborious writer, born at Loſdun, near the Hague, in 1579. He early diſcovered a fondneſs for polite literature and the ſciences; and went to ſtudy the law at Orleans with the ſon of Barneveldt, whom he accompanied in his travels. In 1610, he was made profeſſor of hiſtory at Leyden, and afterwards Greek profeſſor. In the following year, the magiſtrates of the United Provinces proved how high their opinion was of his abilities, by fixing on him to write the hiſtory of his country. Meurſius married in the year 1612. His wife, Anna Catherina Bilberbeccia, deſcended from a very ancient and noble family in Angermond, a city of Pomerania, poſſeſſed many amiable qualities, and rendered his domeſtic life remarkably happy, while he diſcharged the duties of his profeſſorſhip with an aſſiduity equal to his abilities. At the ſame time the republic of letters did not loſe the advantages to be derived from his labours; for during the fourteen years of his reſidence at Leyden, the works which he publiſhed were more numerous than thoſe which had been preſented to the world by the whole body of profeſſors from the original foundation of the univerſity in 1575.

Meurſius's writings had now diſſeminated his reputation in every part of Europe; nor had the fame of his diligence and talents as a profeſſor ſpread with leſs rapidity. In ſo high a rank, indeed, did he ſtand among his literary cotemporaries, that Chriſtian IV. king of Denmark, conferred on him the place of hiſtoriographer royal, and invited him to undertake the profeſſorſhip of hiſtory and politics in the academy of Sora, which was founded by king Frederick II. although the revival of its honours and dignities may be dated from this period, when it ſeemed to be again founded under the auſpices of Chriſtian IV. Meurſius and his family left Leyden in the year 1635. On his arrival at Sora, he was received with the moſt friendly tokens of regard by his majeſty and the Daniſh nobility, and more particularly by Chancellor Roſenkrantz, on whom he has beſtowed very ample praiſes in one of his letters. Here he reſided, equally beloved and admired, for above twelve years. His pupils were not very numerous, but his exertions never relaxed. Thoſe hours likewiſe which were not devoted to the duties of his profeſſorſhip, he employed in reviſing the works of the ancients, and in philological diſquiſitions.

His health was not much impaired by the intenſeneſs of application; but in the year 1638 he had a violent attack of the ſtone, from which diſorder he had ſuffered ſeverely before. In a letter to Voſſius he thus deſcribes his melancholy condition: "The ſtate of my health during the whole of the laſt winter has been truly deplorable. My ſufferings from the ſtone have been realy dreadful. I have voided ſo many, that the repeated diſcharges brought on a wound which emitted blood for above four months. I was next attacked by a tertian fever, which increaſed conſtantly, and produced an univerſal laſſitude of body, a dejection of ſpirits, and a total loſs of appetite. But, thank heaven, I have now in ſome meaſure recovered my ſtrength, and gotten the better of theſe complaints." He recovered from this attack; but in the following year the diſorder returned with redoubled violence, and brought on a conſumption which terminated his exiſtence on the 20th day of September 1639. He left behind him a ſon who was named after him, and one daughter.

So mild were the diſpoſitions of Meurſius, that in all his writings he conſtantly avoided literary diſputes. He was ſometimes unavoidably drawn into them; but conſtantly endeavoured to promote a reconciliation, rather than widen any breach, by his replies to the attacks of his adverſaries. In his friendſhips he was firm and affectionate. Of his domeſtic life, whatever is known has been gathered from his letters. The ſame eaſy tranquillity ſeems to have attended him in every ſituation. In his family he was particularly fortunate. In his ſon, to whom he gave his own name, he ſeemed to behold his own youth renewed. The ſame application, the ſame eagerneſs in the purſuit of knowledge, marked the conduct of this promiſing young man; who did not long ſurvive his father, but died ſoon after he had recommended himſelf to the notice of the learned world by his publications. They were only three in number; but diſplayed ſo much ſolid learning, that they have been aſſigned to the father, John Meurſius, by Labbe Beughem and others. This miſtake was occaſioned as much by the ſimilitude of their names, as by the nature of their works, and their manner of treating philological ſubjects.

His works may be divided into four claſſes, of which each might form a ſeparate volume if they were ever to be republiſhed. Meurſius himſelf indeed, in one of his letters to Voſſius, propoſes ſuch a diviſion. From that epiſtle, and from another which the younger Meurſius ſent to G. I. Voſſius, who ſtrongly adviſed him to republiſh the whole of his father's writings, and from the collections of his poſthumous works which have appeared from Struvius, Groſchupſius, Moller, and ſome others, a catalogue of his works might be formed. Some aſſiſtance will alſo be derived from the indexes publiſhed in their reſpective works, by Hankius, Deſſelius, Wettenius, and Bartholinus. The plan which Meurſius recommends for publiſhing his works, is to inſert in the firſt volume all that he has written relative to Athens; in the ſecond, his hiſtorical pieces; in the third, his miſcellaneous diſſertations; and in the fourth, the various authors which he publiſhed, with his notes and corrections.

Before we conclude, one miſtake with reſpect to this great ſcholar, which prevails very generally, muſt be corrected. A ſcandalous and indecent work, which is intitled *Meurſii elegantiæ Latini ſermonis*, and has *Aloiſiæ Sigeæ Satyræ Sotadicæ* annexed to it is very falſely attributed to Meurſius; nor indeed are the *Satires* with more reaſon aſſigned to Aloiſia Sigea, who was a Spaniſh lady eminent for her piety and virtue. The real author of theſe infamous productions was Weſtrenius, an advocate at Copenhagen, who probably aſſumed the name of Meurſius, in order to ſhield himſelf from the diſgrace which would naturally have attended the writer of ſuch a performance. To inſure the ſale of his book, however, might have been the principal view of Weſtrenius. At any rate, ſuch a concluſion may be fairly deduced from the diſguiſed title, and from his deſire that the world ſhould affix it to a character ſo diſtinguiſhed and reſpectable in almoſt every branch of various literature.

MEW, Sea-mew, or *Sea-mall*. See Larus.

Winter-Mew, or Coddy-moddy, in ornithology. See Larus.

MEWING, the falling off or change of hair, feathers, ſkin, horns, or other parts of animals, which happens in ſome annually, in others only at certain ſtages of their lives: but the generality of beaſts mew in the ſpring. An old hart caſts his horns ſooner than a young one, which is commonly in the months of February and March, after which they begin to button in March or April: and as the ſun grows ſtrong, and the ſeaſon of the year puts forth the fruits of the earth, ſo their heads grow, and are ſummed full by the middle of June. It is to be obſerved, that if a hart be gelt before he has a head, he will never have any; and if he be gelt after he has a head, he will never caſt his horns; again, if he be gelt when he has a velvet-head, it will always be ſo, without fraying or burniſhing.

MEXICO, a province of the Spaniſh empire in America, once a celebrated kingdom, the moſt powerful and civilized in the New World.

1
Kingdoms into which Mexico was anciently divided.

In former times the country now diſtinguiſhed by the name of the *Vale of Mexico*, was called *Anahuac*, the reſt of it being divided into the kingdoms of *Mexico*, *Acolhuacan*, *Tlacopan*, and *Michuacan*; the republics of *Tlaxcallan*, *Cholollan*, *Huexotzinco*, and ſome other ſtates. Of theſe the moſt weſterly was Michuacan, which to the eaſt and ſouth had Mexico; on the north the country of the Chichemecas, and ſome other barbarous nations; on the weſt the lake of Chapallan, and ſome independent tribes. Had four conſiderable cities; the capital being ſeated on the eaſtern ſhore of a beautiful lake named *Pazcuaro*. The kingdom of Tlacopan lay betwixt Mexico and Michuacan, and was of very ſmall extent; its capital was ſeated on the weſtern border of a lake called *Tezcuco*, four miles weſtward of that of Mexico. Acolhuacan was the moſt extenſive as well as the moſt ancient. It was bounded on the eaſt by the republic of Tlaxcallan; on the ſouth by a province of Mexico named Chalco; on the north by the country of the Huaxtecas; and on the weſt by other ſtates of Mexico, terminating at the lake Tezcuco. Its length from ſouth to north was ſomewhat more than 200 miles, and its breadth about 60; it was very populous, and had a great many cities. On the eaſtern bank of the lake of Tezcuco was ſituated the capital of that territory, 15 miles to the eaſtward of that of Mexico; and no leſs celebrated for its antiquity than the politeneſs and civilization of its inhabitants. Tlaxcallan, or Tlaſcala, a celebrated republic, had Acolhuacan to the weſt;

the republics of Cholollan and Huexotzinco to the ſouth; and ſome of the Mexican ſtates on the north and eaſt. It was but of ſmall extent; not reaching more than 50 miles in length and 30 in breadth. Its capital ſtood on the ſide of a great mountain, about 70 miles to the eaſtward of Mexico. The kingdom of Mexico, though the moſt modern, came at laſt to be the moſt extenſive of the whole. On the ſouth and ſouth-weſt it extended as far as the Pacific Ocean; on the eaſt it was bounded by the republics of Tlacopan and Michuacan; on the north by the country of the Huextacas; and on the north-weſt by the country of the Chichemecas; the whole being comprehended between the 14th and 21ſt degrees of north latitude, and between 271 and 283 of longitude, computed from the meridian of Ferro.

2 Uncertainty of the origin of the Mexicans.

If the origin of the nations on the eaſtern continent is obſcure, that of the inhabitants of the weſtern continent is much more ſo; and indeed, till very lately, the hiſtory of every one of the American nations, till the arrival of the Spaniards, has been either treated as entirely fabulous, or very ſlightly touched upon by hiſtorians. By the induſtry of the Abbé Franciſco Clavigero, however, we are now furniſhed with an account of the ancient kingdoms juſt enumerated; more full and authentic than could have been expected, conſidering the difficulty there muſt have been of procuring materials.

3 They came from the north.

According to this gentleman, it is undeniable that Mexico was firſt peopled from the more northerly parts of the continent, which for many ages had been filled with inhabitants. Some have ſuppoſed, from the traditions of the natives, and the diſcovery of very large human ſkeletons in many parts of New Spain, that this country was firſt inhabited by giants: but though ſimilar conjectures and diſcoveries have been made in other countries, we are by no means warranted from thence to conclude that the whole human race were formerly of an immenſe ſize; it being moſt probable, as our author obſerves, that the gigantic race were but a few individuals who lived at different times and in different nations.

4 Toltecans the firſt inhabitants.

The Toltecans are the moſt ancient Mexican nation of which we know any thing. They were expelled, as we are told, from their own country (ſuppoſed by Clavigero to have been *Tollan*, to the northward of Mexico) in the year 472; and for ſome time led a migratory and wandering life. In whatever place they determined to reſide for any conſiderable time, they erected houſes and cultivated the ground. Thus their migrations were extremely ſlow, and it was not till 104 years after they ſet out that they reached a place about 50 miles to the eaſtward of the city of Mexico, where they ſettled for 20 years, giving to their new place of reſidence the name of *Tollantzinco*. From thence they proceeded about 40 miles farther to the weſt, where they built a city called, from the name of their country, *Tollan*, or *Tula*.

5 Their hiſtory.

The Toltecans, during their journeys, were conducted by a number of chiefs; who by the time they arrived at Tollantzinco, were reduced to ſeven, and, after their final ſettlement, the government was changed into a monarchy; but by what means, or on what account, we are not told. Their firſt king began his reign in 667, and their monarchy laſted 384 years, during which time they reckon juſt eight princes. We are not, however, to imagine that each of their kings lived long enough to make up this ſpace. It was a cuſtom among them that the name of the king ſhould be continued for 52 years, and no longer, from the time he aſcended the throne. If he died within that period, the government was carried on in his name by a regency; if he ſurvived, he was obliged to reſign his authority. During the four centuries that the Toltecan monarchy continued, they had increaſed very conſiderably in number, and had built many cities; but when in the height of proſperity, almoſt the whole nation was deſtroyed by a famine occaſioned by drought; and a peſtilence, probably the conſequence of the former. "According to Torquemada (ſays our author), at a certain feſtival-ball made by the *Toltecas*, the *ſad looking* devil appeared to them of a gigantic ſize, with immenſe arms, and in the midſt of the entertainment he embraced and ſuffocated them; that then he appeared in the form of a child with a putrid head, and brought the plague; and, finally, at the perſuaſion of the ſame devil, they abandoned the country of Tula."

These ſtories, according to Clavigero, are taken from the ſymbolical repreſentations or hieroglyphics, by which this piece of hiſtory was repreſented, and which the Spaniſh author has taken literally. Be the cauſe what it will, however, it is certain that the ſurviving Toltecans abandoned their country, and diſperſed themſelves among the ſurrounding nations, where they were well received, on account of their ſuperior knowledge and civilization. They were ſucceeded by the Chichemecas, a much more barbarous people, who came from an unknown country called *Amaquemecan*, where they had for a long time reſided; but of which no traces or remembrance can be found among any of the American nations known to Europeans; ſo that Clavigero ſuppoſes it muſt have been very far to the northward.

6 Succeeded by the Chichemecas.

The motive which the Chichemecas had for leaving their own country is not known. They were eighteen months on their journey, and took poſſeſſion of the deſolate country of the Toltecas about an hundred years after the former had left it. They were much more uncivilized than the Toltecans; but, however, had a regular form of monarchical government, and in other reſpects were leſs diſguſting in their manners than ſome of the neighbouring nations. The laſt king who reigned in Amaquemecan before the departure of the Chichemecas, had left his dominions between his two ſons Auchcauhtli and Xolotl, and the latter conducted the new colony. Having proceeded from the ruins of Tula towards Chempoalla and Tepepolio, Xolotl ſent his ſon to ſurvey the country. The prince croſſed the borders of the lakes and the mountains which ſurround the vale of Mexico; then aſcending to the top of a very high one, he viewed the whole country, and took poſſeſſion of it in the name of his father, by ſhooting four arrows to the four winds.

7 Xolotl their firſt king.

Xolotl being informed by his ſon of the nature of the country, choſe for the capital of his kingdom Tenayuca, about ſix miles to the northward of the city of Mexico, and diſtributed his people in the neighbouring territory; but as moſt of them went to the northward, that part obtained the name of the country

try of the Chichemecas, in diſtinction from the reſt. Here a review of the people was taken, and their number, according to Torquemada, was more than a million. In confirmation of this the hiſtorian adds, that in his time there were ſtill remaining twelve piles of the ſtones they threw to aſcertain their numbers; but Clavigero thinks it improbable that ſo large an army ſhould ſet out on ſo long an expedition, or that ſo ſmall a diſtrict could maintain ſo many hunters.

8 His people civilized by the Toltecans.

Xolotl finding himſelf peacefully ſettled in his new dominion, ſent one of his officers to explore the ſources of ſome of the rivers of the country. While performing this taſk he came to the habitations of ſome Toltecans, who it ſeems had ſtill kept together, and were likely once more to become a nation. As theſe people were not inclined to war, and greatly eſteemed for their knowledge and ſkill in the arts, the Chichemecas entered into a ſtrict alliance with them, and Prince Nopaltzin, who had firſt ſurveyed the country, married a Toltecan princeſs. The conſequence of this alliance was the introduction of the arts and knowledge of the Toltecans among the Chichemecas. Till now the latter had ſubſiſted entirely by hunting, and ſuch fruits and roots as the earth ſpontaneouſly produced. They were clad in the ſkins of wild beaſts, and, like theſe beaſts, they are ſaid to have ſucked the blood of the animals they caught; but after their connection with the Toltecans they began to ſow corn, to learn the art of digging and working metals, to cut ſtones, manufacture cotton, and, in every reſpect, to make great improvements.

9 New inhabitants arrive and obtain ſettlements.

When Xolotl had reigned about eight years in his new territories, an embaſſy of ſix perſons arrived from a diſtant country not far from *Amaquemecan*, expreſſing a deſire of coming with their people to reſide in the country of the Chichemecas. The king gave them a gracious reception, and aſſigned them a diſtrict; and, in a few years after, three other princes, with a great army of Acolhuans, who were likewiſe neighbours of Amaquemecan, made their appearance. The king was at that time at Tezcuco, to which place he had removed his court: and here he was accoſted by the princes, who, in a ſubmiſſive and flattering manner, requeſted him to allow them a place in his happy country, where the people enjoyed ſuch an excellent government. Xolotl not only gave them a favourable reception, but offered them his two daughters in marriage, expreſſing his concern that he had no more, that none might have been excluded from the royal alliance. On the third prince, however, he beſtowed a noble virgin of Chalco, in whom the Toltecan and Chichemecan blood were united. The nuptials were celebrated with extraordinary pomp; and the two nations, after the example of the ſovereigns, continued to intermarry. As the Acolhuans were the more civilized nation of the two, the name of Chichemecas began to be appropriated to the more rude and barbarous part, who preferred hunting to agriculture, or who choſe a life of ſavage liberty in the mountains to the reſtraints of ſocial laws. Theſe barbarians aſſociated with the Otomies, another ſavage nation who lived to the northward, occupying a tract of more than three hundred miles in extent; and by their deſcendants the Spaniards were haraſſed for many years after the conqueſt of Mexico.

10 Diviſion of the dominions of Xolotl.

As ſoon as the nuptial rejoicings were over, Xolotl divided his territories into three parts, aſſigning one to each of the princes. Acolhuatzin, who had married his eldeſt daughter, had Azcopazalco, 18 miles to the weſtward of Tezcuco; Chiconquauhtli, who married the other, had a territory named Xaltocan; and Tzontecomatl, who married the lady of inferior rank, had one named Coatlichan. The country continued for ſome time to flouriſh, population increaſed greatly, and with it the civilization of the people; but as theſe advanced, the vices of luxury and ambition increaſed in proportion. Xolotl found himſelf obliged to treat his ſubjects with more ſeverity than formerly, and even to put ſome of them to death.—This produced a conſpiracy againſt him, which, however, he had the good fortune to eſcape; but while he meditated a ſevere revenge on the conſpirators, he was ſeized with the diſtemper of which he died, in the fortieth year of his reign, and in a very advanced age. His corpſe was adorned with various figures of gold and ſilver, and placed in a chair made of gum copal and other precious ſubſtances, where it remained five days, until the lords ſummoned to the funeral attended. The body was then burnt, and the aſhes depoſited in an urn of the hardeſt ſtone. This urn was kept expoſed in the palace for forty days, during which time the nobility attended with lamentations; after which it was carried to a cave in the neighbourhood, with ſimilar demonſtrations of grief.

11 Nopaltzin the ſecond king.

12 Civil wars.

Xolotl was ſucceeded by his ſon Nopaltzin, who at the time of his acceſſion is ſuppoſed to have been about ſixty years of age. In his time, the tranquillity of the kingdom, which had begun to ſuffer diſturbance under his father, underwent much more violent ſhocks, and civil wars took place. Alcohuatzin, the only one of the three princes who remained alive, thinking the territory he poſſeſſed too narrow, made war upon the lord of a neighbouring province named Tapotzotlan, and deprived him of his territory. Huetzin, ſon to the late prince Tzontecomatl, lord of Coatlichan, fell in love with the grand-daughter of the queen, a celebrated beauty, but was rivalled by a neighbouring lord, who determined to ſupport his pretenſions by force of arms. Huetzin, however, got the better, defeated and killed his adverſary, and then poſſeſſed himſelf of the lady and his eſtate. This was followed by a rebellion of the whole province of Tollantzinco, ſo that the king himſelf was obliged to take the field. As the rebels were very numerous, the royal army was at firſt defeated; but having at laſt received a ſtrong reinforcement, the rebels were overcome, and their ringleaders ſeverely puniſhed. The king did not long ſurvive the reſtoration of tranquillity to his dominions. He died in the thirty ſecond year of his reign, and ninety-ſecond of his age, leaving the throne to his eldeſt ſon Tlotzin.

13 Tlotzin.

We are not informed of any particulars relating to this prince farther than he was of an excellent diſpoſition, greatly beloved by his ſubjects, and, though addicted to peace, yet aſſiduous in exerciſing his people in the art of war. He reigned thirty-ſix years, and died of a very painful diſeaſe.

14 Quinatzin a luxurious prince.

Quinatzin, the ſon and ſucceſſor of Tlotzin, proved a vain and luxurious prince. His acceſſion to the throne was celebrated with much greater pomp than any of his predeceſſors. Xolotl had removed his court from Tenayuca to Tezcuco; but being diſguſted with this laſt place, on account of the conſpiracy formed againſt him there, he had returned to Tenayuca.—There the court continued till the reign of Quinatzin, who removed it back to Tezcuco. In his paſſage thither, he cauſed himſelf be tranſported in an open chair or litter, carried on the ſhoulders of four of his principal lords, while four others held an umbrella over his head. Before his time the kings had been accuſtomed to walk upon their feet like other people; but this example, once ſet, was quickly followed by all the lords and great people in the kingdom, who now ſtrove to out-do one another in expenſive and oſtentatious grandeur.

15 Diſturbances in various parts. The reign of Quinatzin, though tranquil at firſt, was ſoon diſturbed by dangerous revolts and rebellions. Theſe firſt broke out in two ſtates, named Maztillen and Totopec, ſituated among the northern mountains. The king, having collected a great army, marched without delay againſt the rebels, and challenged their leaders to come down and fight him in the plain.—This challenge being accepted, a furious engagement enſued, in which, though great numbers fell on both ſides, no deciſive advantage was gained by either party. Frequent engagements took place for the ſpace of forty days, until at laſt the rebels, perceiving that their own number were daily diminiſhing, without any poſſibility of being recruited like the royal army, made a final ſurrender to the king, who puniſhed the ringleaders with great ſeverity. Tranquillity, however, was not yet reſtored: the rebellion ſpread to ſuch a degree, that the king was obliged not only to take the field in perſon, but to employ ſix other armies, under the command of faithful and experienced generals, to reduce the rebels. Thoſe proved ſo ſucceſsful in their enterprizes, that in a ſhort time the rebellious cities were reduced to obedience, and the kingdom enjoyed the bleſſings of peace during the long reign of Quinatzin, who is ſaid to have ſat on the throne for no leſs than ſixty years. He was ſucceeded by his ſon Techotlatla; but as the affairs of the Acolhuans now began to be connected with thoſe of the Mexicans, it will be proper to give ſome account of that people.

16 Migrations of the Mexicans. The Mexicans, called alſo the Aztecas, dwelt till the year 1160 in a country called *Aztlan*, ſituated to the north of the gulf of California, as appears by the route they purſued in their journey: but how far to the northward we are not certainly informed. Betancourt makes it no leſs than 2700 miles, and Boturini ſays it was a province of Aſia. The cauſe of their migration is ſaid to have been as follows:

Among the Aztecas was a perſon of great authority, named *Huiztilin*, to whoſe opinion every one paid the utmoſt deference. He had conceived a deſign, for what reaſon we know not, to perſuade his countrymen to change their reſidence; and to effect this he fell upon the following ſtratagem. Having heard, while meditating on his ſcheme, a little bird ſinging on the branches of a tree, the notes of which reſembled the word *Tihui*, which in the Azteca language ſignified "let us go," he took that opportunity to work upon the ſuperſtition of the people. With this view, he took along with him a reſpectable perſon, and made him attend to the note of the bird. "What can it mean (ſays he), but that we muſt leave this country, and find ourſelves another? Without doubt it is the warning of ſome ſecret divinity who watches over our welfare: let us obey, therefore, his voice, and not draw his anger upon us by a refuſal." Tecpaltzin, for that was the name of his friend, readily agreed to the interpretation; and both of them being perſons of great influence, their united perſuaſions ſoon gained over to their project the bulk of the nation; and they accordingly ſet out.

This account, though it has ſomewhat the air of fable, is what the Mexicans themſelves give; and is certainly more worthy of credit than that of the Spaniards, who maintain that the Aztecas ſet out by the expreſs command of the devil. But whatever was their motive, it is certain that they began their migration about the year abovementioned. Torquemada ſays, that in all the hieroglyphic paintings which record this migration, there is delineated an arm of the ſea, or a great river, which however, Clavigero takes to be a repreſentation of the univerſal deluge. Boturini ſuppoſes it to have been the gulf of California, over which, he thinks, they tranſported themſelves; but our author controverts this opinion, becauſe there are no remains of the buildings they conſtructed, during their migration, in California as there are in other places. If there really was any river of conſequence which they croſſed, he ſays it muſt have been the *Colorado*, or Red River, which diſcharges itſelf into the gulf of California, in lat. 32°. 30. Having croſſed this beyond the lat. of 35°. they proceeded towards the ſouth-eaſt, as far as the river *Gila*, where they ſtopped for ſome time; and on the banks of that river there are remains of the great edifices they conſtructed. From thence having reſumed their courſe towards the S. S. E. they proceeded to lat. 29°. and ſtopped again at a place upwards of 250 miles diſtant from the city of Chihuahua, towards the N. N. W. This place is now known by the name of *Caſe grandi*, on account of a very large building ſtill extant, and univerſally attributed to them by the traditions of the country. It is conſtructed on the plan of thoſe of New Mexico, that is, conſiſting of three floors with a terrace above them, and without any entrance to the under floor. The door for entrance opens to the ſecond floor; ſo that a ſcaling ladder is neceſſary: and the inhabitants of New Mexico build in this manner, in order to be leſs expoſed to the attack of their enemies; putting out the ſcaling ladder only for thoſe to whom they give admiſſion into their houſes. No doubt the Aztecas had the ſame motive for raiſing their edifice on this plan, as every mark of a fortreſs is to be obſerved in it, being defended on one ſide by a lofty mountain, and the reſt ſurrounded by a wall about ſeven feet thick, the foundations of which are ſtill exiſting. In this there are ſtones as big as mill-ſtones; the beams of the roof are of pine, and well finiſhed. In the centre is a little artificial mount, apparently conſtructed with a deſign to keep guard on, and obſerve the enemy. Some ditches have been formed in this place, and ſeveral kitchen utenſils found, as earthen pots, diſhes, and jars, with ſome looking-glaſſes made of a ſtone called *itztli*.

The Atzecas having ſtaid here as long as they thought proper, croſſed the mountains of Tarahumara, directed their courſe ſouthward, and ſtopped again for three years at Culiacan, a place ſituated on the gulf of California in 24 degrees north latitude. Here they formed a wooden image of a god called *Huitzilopochtli*, whom they imagined to be their tutelar deity, and made a chair of reeds and ruſhes to tranſport it calling this vehicle *the chair of God*. Four prieſts were choſen, to carry the image on their ſhoulders, whom they called *the ſervants of God*; and the act of carrying it they name *teomama*, which ſignifies "to carry *God* on ones *back*."

17 Separation of the tribes.

The Aztecas, when they left their original habitations, were divided into ſix tribes; but here the Mexicans were left with their god by five of them, viz. the Xochimilcas, Tepanecas, Chalceſe, Tlahuicas, and Tlaſcalans. The cauſe of this ſeparation is not known. The tribes juſt mentioned pretend that it was done at the expreſs command of God; but there can be little doubt that it was occaſioned by ſome diſagreement among themſelves. This is rendered farther probable, when we conſider that on their journey towards Tula, the remaining tribe was divided into two violent factions, which alternately perſecuted one another: neither did they afterwards conſtruct any more edifices. However, they always travelled together, in order to enjoy the company of their imaginary God. At every place where they ſtopped an altar was erected to him; and at their departure they left behind them all their ſick, and probably alſo ſome others to take care of them, or ſuch as were not willing to endure the fatigue of farther journeys. They ſtopped in Tula nine years, and eleven more in the neighbouring parts. At laſt, in 1216, they arrived at Zumpanco, a conſiderable city in the vale of Mexico, where they were received in a very hoſpitable manner by the lord of that diſtrict. He not only aſſigned them proper habitations, but became very much attached to them; and even demanded from among them a wife for his ſon Ilhuicatl. This requeſt was complied with; and from this marriage all the Mexican kings deſcended

18 The Mexicans perſecuted,

The Mexicans continued to migrate from one place to another along the lake of Tezcuco. Xoltotl, who was then on the throne of the Acolhuans or Chichemechas, allowed them to ſettle in whatever places of his dominions they thought proper; but ſome of them finding themſelves haraſſed by a neighbouring lord, were obliged, in 1245, to retire to Chapoltepec, a mountain on the weſtern borders of the lake, ſcarce two miles diſtant from the ſite of Mexico. This took place in the reign of Nopaltzin; when, as has already been obſerved, diſturbances began to take place in the Acolhuan dominions. The Mexicans, however, did not find themſelves any more ſecure in their new place of reſidence than formerly: they were perſecuted by the neighbouring lords, and obliged to take refuge in a number of ſmall iſlands, named *Acocolco*, at the ſouthern extremity of the lake of Mexico. Here for 52 years they lived in the moſt miſerable manner that can be imagined; ſubſiſting on fiſh, inſects, roots, &c. and clothing themſelves with the leaves of the amoxtli, which abounds in that lake.

19 And enſlaved.

In this miſerable plight the Mexicans continued till the year 1314, when they were all reduced to a ſtate of the moſt abſolute ſlavery. This was done by the king of a petty ſtate named Colhuacan: but there are different accounts of the manner in which it was effected. Some ſay that this prince, unwilling to allow the Mexicans to maintain themſelves in his territories without paying tribute, made war upon them, ſubdued and enſlaved them. Others affirm, that, pretending compaſſion for their miſerable ſituation, he offered them a more commodious place of reſidence. The Mexicans accepted the offer with great pleaſure; but had ſcarcely ſet out to take poſſeſſion of their new place of reſidence when they were attacked by the Colhuans, made priſoners, and carried off for ſlaves.

20 They regain their liberty in conſequence of a monſtrous piece of cruelty.

After ſome years a war broke out betwixt the Colhuans and Xochimilcas; in which the latter gained ſuch advantages, that they were obliged to employ their ſlaves to aſſiſt them. They accordingly ordered them to prepare for war, but without furniſhing them with arms neceſſary for a military enterpriſe; ſo that the Mexicans were obliged to content themſelves with long ſtaves, having their points hardened in the fire: they alſo made knives of the ſtone itztli, and ſhields of reeds woven together. They agreed among themſelves not to waſte their time, as was uſual, in making priſoners, but to content themſelves with cutting off one ear of their enemies, and then leaving them without farther injury. They adhered punctually to this reſolution; and ruſhing furiouſly upon the Xochimilcas, cut off an ear from as many as they could, killing thoſe who ſtruggled to ſuch a degree that they could not effect their purpoſe. In ſhort, ſo well did the Mexicans acquit themſelves in this engagement, that the Xochimilcas not only abandoned the field, but were obliged to take refuge among the mountains. After the battle, the Colhuan ſoldiers preſented themſelves before their general with the priſoners they had taken; for it was by the number of theſe, not of the enemy left dead on the field, that they judged of their valour. The Mexicans had taken only four, and theſe they kept concealed for the abominable purpoſe of ſacrificing them. The Colhuans, therefore, ſeeing no trophies of their valour, began to reproach them with cowardice; but the Mexicans, producing their baſkets of ears, deſired them to judge from theſe how many priſoners they might have taken, had they not been unwilling to retard their victory by taking up time in binding them.

21 The firſt human ſacrifice in Mexico.

Notwithſtanding the valour diſplayed by the Mexicans in this engagement, it doth not appear that their haughty maſters were in the leaſt mollified or inclined to afford them eaſier terms than before. Having erected an altar to their god, they demanded of their lord ſomething precious to offer in ſacrifice to him; but he in diſdain ſent them a dirty cloth, incloſing the filthy carcaſe of a vile bird. This was carried by Colhuan prieſts; and without any ceremony laid upon the altar. The Mexicans, with apparent unconcern, removed this filthy offering, and put in its place a knife made of itztli, and an odoriferous herb. On the day of conſecration, the Colhuan prince failed not to attend with his nobility; not with a view to do honour to the feſtival, but to make a mockery of the Mexicans. Their deriſion, however, was ſoon changed into horror, when the Mexicans, after a ſolemn dance, brought forth the four Xochimilcan priſoners they had taken; and, after having made them dance a little, cut open their breaſt, with the knife which lay on the altar, and plucking out their hearts, offered them, while yet warm and palpitating with life, to their diabolical idol. This horrible ſacrifice had ſuch an effect upon the ſpectators, that both king and ſubjects deſired the Mexicans immediately to quit their territories and go where they pleaſed. This order was inſtantly obeyed: the whole nation took their rout towards the north, until they came to a place named *Acatzitzintlan*, ſituated betwixt two lakes, and afterwards named *Mexicalizinco;* but for ſome reaſon or other, being diſcontented with this ſituation, as indeed they ſeem very often to have been, they proceeded to *Iztacalco*, ſtill nearer to the ſite of Mexico. Here they formed the image of a little mountain of paper, and danced round it a whole night, ſinging their victory over the Xochimilcas, and returning thanks to their god for having freed them from the yoke of the Colhuas. Clavigero is of opinion, that by this mountain they repreſented Colhuacan, as in their pictures it was always repreſented by a hunch-backed mountain; and this is the literal ſignification of the name.

22
They ſettle at laſt on the iſlands on which Mexico was built.

Having ſtaid two years in Iztacalco, they came to a place on the lake where they found a nopal or opuntia growing in a ſtone, and over it the foot of an eagle. All the Mexican hiſtorians ſay that this was the mark given them by their oracle of the place where they were finally to ſettle. Here, then, they put an end to their wanderings; and, as ſoon as they had taken poſſeſſion of the ſpot, an altar was erected to the god, or rather devil, whom they worſhipped. The altar was conſecrated in a manner conformable to the cruel religion which theſe people had adopted. Having at that time no priſoners among them, one of their number went out in queſt of ſome animal for a victim; but happening to meet with a Colhuan, a quarrel enſued; and the Mexican proving victorious, bound his enemy, brought him home, and preſented his heart to the idol. Around this altar they now began to build their habitations; which, like the celebrated city of Rome, conſiſted at firſt of a parcel of miſerable ruſh huts; as they were then furniſhed with no better materials. Their city, if ſuch it might be called, was named *Tenochtitlan*, and afterwards *Mexico*, which name afterwards prevailed; and, according to Clavigero, ſignifies the place of *Mexitli* or *Huitzilopochtli*, their god of war: and in this reſpect alſo the founding of Mexico was ſimilar to that of Rome, the latter being protected by *Mars* their god of war, as the Mexicans were by *Mexitli*.

23
Their miſerable ſituation at firſt.

The city of Mexico was founded in the year 1325, in the moſt incommodious ſituation we can imagine, viz. on a ſmall iſland named Tenochtitlan, in the middle of a great lake, without ground to cultivate for their ſubſiſtence, or even room ſufficient to build their habitations. Their life was therefore as miſerable here for ſome time as it had been when they were on the iſlands at the end of the lake, and they were reduced to the ſame ſhifts to maintain themſelves. To enlarge the boundaries of their iſland, they drove paliſades into thoſe parts of the water which were moſt ſhallow, terracing them with ſtones and turf, and uniting to their principal iſland ſeveral other ſmaller ones which lay in the neighbourhood. To procure to themſelves afterwards ſtones, wood, &c. for conſtructing their habitations, as well as clothing and other neceſſaries, they inſtituted a commerce with the people who dwelt on the borders of the lake, ſupplying them with fiſh, water-fowl, and other more minute inhabitants of the lake and marſhes, which they contrived to render eatable; and in return, for all this they received the neceſſaries abovementioned. The greateſt effort of their induſtry, however, was the conſtruction of floating gardens, by means of buſhes and mud of the lake; and theſe they brought to ſuch perfection that they produced maize, pepper, chia, French beans, and gourds.

24
The two factions ſeparate.

For thirteen years that the Mexicans had to ſtruggle with extreme difficulty, they remained at peace; but no ſooner did they begin to proſper and live comfortably, than the inveterate enmity betwixt the two factions formerly mentioned broke out in all its fury. This produced a ſeparation; and one of the parties took up their reſidence on a ſmall iſland at a little diſtance to the northward, which, from an heap of ſand found there, they at firſt named *Xaltilolco*, but afterwards *Tlatelolco*, from a terrace conſtructed by themſelves. This iſland was afterwards united to that of Tenochtitlan.

25
Monſtrous barbarity of their religion.

About this time the Mexicans divided their city into four parts, a diviſion which ſtill ſubſiſts; each quarter having now its tutelar ſaint, as it had formerly its tutelar god. In the midſt of their city was the ſanctuary of their great god *Mexitli*, whom they conſtantly preferred to all the reſt. To him they daily performed acts of adoration: but inſtead of making any progreſs in humanity, they ſeem to have daily improved in the moſt horrible barbarities, at leaſt in their religion. The dreadful ſacrifices made of their priſoners already mentioned, could only be exceeded by that which we are now about to relate. Being now on a more reſpectable footing than formerly, they ſent an embaſſay to the petty king of Colhuacan, requeſting him to ſend them one of his daughters, that ſhe might be conſecrated the mother of their protecting god. The unſuſpecting prince, intoxicated with the thoughts of having his daughter made a goddeſs, readily complied with their deſire.—The unfortunate princeſs was conducted in great triumph to Mexico; but no ſooner was ſhe arrived, than ſhe was ſacrificed in the ſhocking manner above related; and, to add to the horror of the deed, the body was flayed, and one of the braveſt young men of the nation dreſſed in her ſkin. Her father, ignorant of this dreadful tranſaction, was invited by the Mexicans to be preſent at the apotheoſis of his daughter, and went to ſee the ſolemnity, and to worſhip the new divinity. He was led into the ſanctuary, where the young man ſtood clothed in the bloody ſkin of his daughter; but the darkneſs of the place prevented him from ſeeing what was before him. They gave him a cenſor in his hand, and ſome copal to begin his worſhip; but having diſcovered by the flame of the copal the horrible ſpectacle, he ran out in a diſtracted manner, calling upon his people to revenge the injury; but this they were not able to do at that time nor ever after. Hiſtorians are unanimous, that this ſacrifice was performed at the expreſs command of the devil; and indeed in this inſtance, their credulity ſeems pardonable; though Clavigero, with more reaſon, aſcribes it to his prieſts.

In the year 1352 the Mexican government was changed from an ariſtocracy to a monarchy. At firſt they were governed by 20 lords, of whom one had an authority ſuperior to the reſt. This naturally ſuggeſted the idea of monarchy; and to this change they were alſo induced by the contemptible ſtate in which their nation ſtill continued, thinking that the royal dignity would confer upon it a degree of ſplendor which otherwiſe it could not enjoy; and that by having one leader, they would be better able to oppoſe their enemies. Proceeding, therefore, to elect a king, the choice fell upon Acamapitzin, a man of great eſtimation among them, and deſcended from Opochtli a noble Atzecan, and a princeſs of the royal family of Colhuacan. As he was yet a batchelor, they attempted to negociate a marriage, firſt with the daughter of the lord of Tacuba, and then of the king of Azcapozalco: but theſe propoſals being rejected with diſdain, they applied to Acolmiztli lord of Coatlichan, and a deſcendent of one of the three Acolhuan princes; who complied with their requeſt, and the nuptials were celebrated with great rejoicings.

26
Acamapitzin the firſt king of Mexico.

27
The Tlatelolcos alſo chooſe a king.

In the meantime, the Tlatelolcos, the natural rivals of the Mexicans, reſolved not to be behind them in any thing which had the leaſt appearance of augmenting the glory of their ſtate. They likewiſe, therefore, choſe a king; but not thinking proper to chooſe him from among themſelves, they applied to the king of the Tepanecas, who readily ſent them his ſon; and he was crowned firſt king of Tlatelolco in 1353. In this the Tlatelolcos ſeem to have had a deſign of humbling their rivals, as well as rendering themſelves more reſpectable; and therefore it is probable, that they had repreſented the Mexicans as wanting in that reſpect due to the Tepanecan monarch, as having elected a king without his leave, though at the ſame time they were tributaries to him. The conſequence of this was, that he took a reſolution to double their tribute. Hitherto they had paid only a certain number of fiſh and water-fowl; but now they were ordered to bring alſo ſeveral thouſands of fir and willow plants to be ſet in the roads and gardens of Azcapozalco, and to tranſport to the court a great floating garden, which produced vegetables of every kind known in Anahuac. This being accompliſhed with great difficulty, the king commanded them next year to bring him another garden, with a duck and ſwan in it both ſitting upon eggs; but ſo, that on their arrival at Azcapozalco the brood might be ready to hatch. This was alſo done; and the prince had the ſatiſfaction of ſeeing the young birds come out of the eggs. The third year they were ordered to bring a live ſtag along with a garden. This was more difficult than any of the former taſks; becauſe they were obliged, in order to hunt the ſtag, to go to the mountains of the continent, where they were in danger of falling into the hands of their enemies; however, this alſo was accompliſhed, and the deſire of the king gratified.

28
Mexicans oppreſſed.

In this manner the Mexicans were oppreſſed for no leſs than 50 years. They freed themſelves, however, from all their difficulties by vigorous exertions, abſurdly aſcribing to the protection of that malevolent being whom they worſhiped the glory of every deliverance. Acamapitzin governed this city which at that time comprehended the whole of his dominions, for 37 years in peace. His queen being barren, he married another wife, but without abandoning the firſt; and theſe two, inſtead of being rivals to one another, lived together in the utmoſt harmony; the firſt wife taking upon herſelf the charge of educating *Huitzilihuitl*, the ſon of the ſecond. He had, beſides, ſeveral children by other women, and one named *Itzcoatl*, who afterwards proved one of the beſt and moſt renowned kings who ſat on the throne of Mexico. He is ſaid alſo to have conquered four conſiderable cities; but Clavigero thinks he muſt in this only have been an auxiliary, it being very improbable, that while he could ſcarce maintain his own territories, he ſhould think of foreign conqueſts.

Acamapitzin died in 1389, greatly lamented by the Mexicans, and his death was followed by an interregnum of four months. As the deceaſed monarch had formerly reſigned his authority into the hands of his nobles, it was neceſſary that a new election ſhould take place; and when this was done, the choice fell upon Huitzilihuitl, the ſon of Acamapitzin. As he was ſtill unmarried, it was reſolved, if poſſible, to procure him an honourable and advantageous match. With this view, a deputation of nobility was ſent to the king of Azcapozalco, requeſting, in very humble terms, an alliance with one of his daughters. The expreſſions made uſe of by theſe ambaſſadors are ſaid by our author to have been particularly elegant in the Mexican language: but it is difficult to underſtand how a ſpeech made among a people ignorant of the art of writing could be particularly recorded at the interval of ſome hundreds of years after. They are as follow: "We beſeech you, with the moſt profound reſpect, to take compaſſion on our maſter and your ſervant Huitzilihuitl, confined among the thick ruſhes of the lake.—He is without a wife, and we without a queen,—Vouchſafe, Sir, to part with one of your jewels or moſt precious feathers. Give us one of your daughters, who may come to reign over us in a country which belongs to you."

29
Huitzilihuitl the ſecond king.

30
Marries a daughter of the king of the Tepanecans.

This piece of oratory had ſuch an effect upon the king, that he granted their requeſt, and a Tepanecan princeſs was conducted in great triumph to Mexico, where the marriage was ſolemnized with the utmoſt joy. Though this princeſs brought him a ſon the firſt year of their marriage, the king, in order to ſtrengthen himſelf by freſh alliances, married alſo the daughter of another prince, by whom he had Montezuma *Ilhuacamina*, the moſt celebrated of all the Mexican kings.

31
Reign of Techotlala king of Acolhuan.

We muſt now return to the hiſtory of the Acolhuans, who at this time were governed by Techotlala the ſon of Quimatzin. For 30 years this prince enjoyed an uninterrupted tranquillity. This was interrupted by the revolt of Tzompan, prince of Xaltocan, and the laſt of the family of Chiconquauhtli, one of the three original Acolhuan princes, who had drawn into his conſpiracy the ſovereigns of ſix other ſtates. The king, out of reſpect to the quality of the rebel, offered to pardon him if he would lay down his arms; but Tzompan, confident of his ſtrength, rejected the offer with contempt. The king was therefore obliged to ſend an army againſt him, in which the Tepaneccans and Mexicans ſerved as auxiliaries. The war laſted only two months; Tzompan was defeated and put to death, along with ſeveral others of the principal rebels. The Mexicans, who had behaved with great valour, returned in triumph to their city, while Techotlala took ſeveral very prudent meaſures to ſtrengthen his government, prevent rebellions in future, and to augment the ſplendor of his throne.

32
Maxtlaton an inveterate enemy to the Mexicans.

In conſequence of the renown acquired in this war by the Mexicans, and the advantages reſulting from the alliance with the king of Azcapozalco, that people now began to be held in much higher eſtimation by their neighbours than before. They extended their commerce, and in conſequence of that, came to wear cotton inſtead of the threads of the wild-palm, which had formerly conſtituted their whole dreſs: but this gleam of proſperity was ſoon overcaſt, and they had to encounter a more inveterate and formidable enemy than any that they had yet met with. This was Maxtlaton prince of Coyoacan, and ſon to the king of Azcapozalco. Being of a cruel and revengeful temper, for which he was dreaded even by his father, he reſolved to reſent the indignity which he pretended to have been done to him by the marriage of his ſiſter to the king of Mexico. The true cauſe of his diſpleaſure, however, was his fear that the Tepanecan crown might devolve on his ſiſter's ſon by Huitzilihuitl; and to prevent this, he took the barbarous method of ſending aſſaſſins to murder his nephew. The king of Mexico was not then able to reſent the injury; for though, by his marriage with the Tepanecan princeſs, the oppreſſive tribute was taken off, and the Mexicans had only to pay a couple of ducks annually, by way of acknowledging the Tepanecan ſuperiority, yet the one nation was far from being in a condition to cope with the other.—The barbarity of Maxtlaton was not unknown to his father; but it is certain that he did not reſent it; and indeed there is great reaſon to ſuppoſe that he took part with his ſon in moſt of his wicked enterpriſes.

As the Mexicans advanced in wealth and power, ſo did their rivals the inhabitants of Tlatlelolco.—Their firſt king died in 1399, leaving his ſubjects greatly improved in civilization, and the city much enlarged and beautified. The rivalſhip which ſubſiſted between the two cities had indeed greatly contributed to the aggrandizement of both. The Mexicans had formed ſo many alliances by marriage with the neighbouring nations, had ſo much improved their agriculture, and floating gardens on the lake, and had built ſo many more veſſels to ſupply their extended commerce and fiſhing, that they were enabled to celebrate their ſecular year, anſwering to A. D. 1402, with greater magnificence than they had ever done ſince they left their original country of Atzlan.

33
Unfortunate reign of Techotlala's ſon.

All this time Techotlala continued to reign in Acolhuacan; but being now very far advanced in years, and finding his end approach, he called to him his ſon Ixtlilxochitl, and recommended to him to beware of the ambitious diſpoſition of the king of Azcapozalco, as he was apprehenſive that he might attempt ſomething againſt the peace of the empire. His ſuſpicions were verified; for on the death of Techotlala, which happened in 1406, the king of Azcapozalco, without making the uſual ſubmiſſions to the new king, to whom he was a feudatory, ſet out for his own territories, with a view to ſtir up the other feudatory princes to rebellion. Having called to him the kings of Mexico and Tlatlelolco, he told them, that Techotlala, who had long tyrannized over that country, being dead, he deſigned to procure freedom to the princes, ſo that each might rule his own territory entirely independent of the king of Acolhuacan; but for this purpoſe he needed their aſſiſtance, and truſted to their well known ſpirit to take part with him in the enterpriſe. He informed them likewiſe, that in order to enſure ſucceſs, he would find means to unite other princes in the confederacy.

The new king of Acolhuacan, in the mean time, was employed in ſettling the affairs of his kingdom, and endeavouring to gain the good will of his ſubjects. The combination againſt him was ſoon diſcovered: but though Ixtlilxochitl was deſirous of heading his army in perſon, he was diſſuaded from ſo doing by his courtiers; ſo that the conduct of the war was committed to his generals. To weaken the enemy they ravaged the territories of ſix revolted ſtates: but notwithſtanding this, and the ſuperior diſcipline of the royal army, the war was carried on by the rebels with great obſtinacy, their armies being conſtantly recruited by freſh troops in proportion to their loſſes. At laſt, after three years of a ruinous war the king of Azcapozalco, finding that his reſources would at laſt fail him, ſued for peace; but with a deſign of accompliſhing by treachery what he had not yet been able to do by force. His adverſary, equally reduced with himſelf, conſented to a peace, though he knew very well that the Tepanecan prince intended to obſerve it no longer than ſuited his purpoſe.

34
Chimalpopoca third king of Mexico.

In the year 1406 died Huitzilihuitl king of Mexico, who likewiſe left the right of electing a ſucceſſor to the nobility. They made choice of his brother Chimalpopoca; and from thence it became an eſtabliſhed law to chooſe one of the brothers of the deceaſed king, or if he had no brothers to elect one of his grandſons. While the new prince was endeavouring to ſecure himſelf on the throne, the treacherous Tezozomoc uſed all means in his power to ſtrengthen the party he had formed againſt the king of Acolhuacan. In this he was attended with ſuch ſucceſs, that the unfortunate prince found himſelf reduced to the neceſſity of wandering among the neighbouring mountains, at the head of a ſmall army, accompanied by the lords of Huexolta and Coatlichan, who remained always faithful to him. The Tepanecans diſtreſſed him to ſuch a degree, by intercepting his proviſions, that he was forced to beg them of his enemies. One of his grandſons was ſent to Otompan, a rebel ſtate, to requeſt them to ſupply their king with the proviſions he ſtood in need of, and to exhort them to abandon the cauſe of the rebels, which they had eſpouſed. No taſk could be more dangerous; yet ſuch was the magnanimity of the young prince's diſpoſition, that he readily ſet out on the journey; nor was he deterred by the information he got that there were in the place certain Tepanecans who had come on purpoſe to publiſh a proclamation from Tezozomoc. He went boldly to the moſt public place of the town, and in preſence of thoſe who

35
Diſtreſs and death of the king of Acolhuacan.

who publiſhed the proclamation made known his requeſt. This heroiſm, however, did not meet with the ſucceſs it deſerved. His propoſitions were derided from the moment they were made; but the people did not offer any farther inſult, until one of the meaner ſort threw a ſtone at him, exciting others of the ſame ſtamp to put him to death. The Tepanecans, who had hitherto continued ſilent, perceiving their opportunity, joined in the general cry to kill the prince, and began alſo to throw ſtones. The prince attempted firſt to defend himſelf, and afterwards to eſcape by flight; but, both being equally impoſſible, he fell under a ſhower of ſtones. The Tepanecans exulted in this act of treachery, and ſoon after cut off Ixtlixochitl himſelf, after having treacherouſly perſuaded him to a conference with two of their captains. This perfidious act was committed in ſight of the royal army, who were too weak to revenge it: the royal corpſe was ſaved with difficulty; and *Nezahualcojotl*, heir apparent to the crown, was obliged to ſhelter himſelf among the buſhes from the fury of his enemies.

36
Acolhuacan conquered by Tezozomoc.

Tezozomoc having now in a great meaſure gained his point, proceeded to pour down his troops upon thoſe cities and diſtricts which had remained faithful to the late unfortunate monarch. The people made a moſt deſperate defence, and killed vaſt numbers of their enemies; but at laſt being themſelves reduced by the calamities of war, and in danger of total extermination, they were obliged to quit their habitations and fly to other countries. The tyrant, then finding himſelf ſuperior to all his adverſaries, gave Tezcuco in fief to Chimalpopoca king of Mexico, Huexotla to Tlacacotl king of Tlatelolco; placing faithful governors in other places, and appointing Azcapozalco, the capital of his own territory, the royal reſidence and capital of Acolhuacan.

Prince Nezahualcajotl was preſent in diſguiſe at this diſpoſal of his dominions, along with ſeveral other perſons of diſtinction who were enemies of the tyrant; and ſo much was he tranſported with paſſion, that it was with difficulty he could be reſtrained from killing Tezozomoc on the ſpot, though this would certainly have been done at the expence of his own life. All the reſt of the Acolhuacan empire ſubmitted; and Nezahualcojotl ſaw himſelf for the preſent deprived of all hopes of obtaining the crown.

37
His tyranny and death.

Tezozomoc had now attained the ſummit of his ambition: but inſtead of conciliating the minds of his new ſubjects, oppreſſed them with new taxes; and being conſcious of the precarious ſituation in which he ſtood, and tormented with remorſe on account of his crimes, fell into melancholy, and was haunted with frightful dreams. In one, he imagined that Nezahualcojotl, transformed into an eagle, had eat out his heart; and in another, that, in the ſhape of a lion, he licked his body and ſucked his blood. Terrified by theſe viſions, he called his three ſons, Tajatzin, Teuctzintli, and Maxtlaton, enjoining them to put to death Nezahualcojotl as ſoon as they could get it done without being publicly known. He himſelf ſurvived his dreams only about a year. He was now become ſo old, that his body no longer retained its natural heat. He was therefore obliged to be covered up with cotton in a great cradle, not being able to ſit erect in a chair. In this miſerable condition, however, he never forgot his tyranny nor cruelty. From his cradle he iſſued oppreſſive laws relating to the Acolhuacans; and almoſt with his laſt breath renewed his commands with regard to Nezahualcojotl. At laſt he expired in the year 1422, leaving the crown to his ſon Tajatzin.

38
The throne uſurped by Maxtlaton.

Tezozomoc was no ſooner dead than Maxtlaton, without paying the leaſt regard to his father's will, began to exerciſe the functions of a ſovereign. Though it was the right of Tajatzin to invite to his father's funeral whom he pleaſed, Maxtlaton took that upon himſelf. Nezahualcojotl, though not invited, came among the reſt; but though Teuctzintli, brother to Maxtlaton, inſiſted upon his being put to death, the latter oppoſed it, as it could not then be done privately, and he hoped to find another opportunity. No ſooner were the funeral ceremonies over, however, than Maxtlaton behaved in ſuch a manner to his brother Tajatzin, that the prince thought proper to retire to Chimilpopoca king of Mexico, to whom he had been particularly recommended by his father, in order to have his advice. This monarch, agreeable to the character of that age and people, adviſed him to invite his brother to an entertainment, and then murder him. Unluckily for them both, this diſcourſe was overheard by a ſervant, who in expectation of a reward informed the tyrant of what he had heard: but inſtead of this, Maxtlaton, pretending to diſbelieve his ſtory, drove the informer from his preſence with ignominy. Notwithſtanding this pretence, the tyrant had not the leaſt doubt of the truth of what was told him; and therefore determined to rid himſelf of his brother without delay. This he ſoon accompliſhed in the very ſame way that had been projected againſt himſelf. Tajatzin, along with the king of Mexico, Tlatelolco, and ſome other feudatory princes, were invited by Maxtlaton to an entertainment. The king of Mexico prudently excuſed himſelf, but the unſuſpecting Tajatzin fell into the ſnare. He came to the place of entertainment, and was inſtantly put to death. The company were greatly alarmed; but Maxtlaton, having explained to them his reaſon for ſo doing, they not only excuſed him, but proclaimed him king; to which it is not to be doubted that their fears greatly contributed.

39
Tajatzin murdered.

40
Miſerable fate of the king of Mexico.

Though the king of Mexico eſcaped a ſudden death by his abſence at this time, it was only to periſh in a more ſlow and ignominious manner. The vengeance of Maxtlaton firſt appeared by ſending him a woman's dreſs in return to the preſent he ſent him as a feudatory; which being a reflection upon his courage, was the higheſt affront that could be offered him. This inſult, however, was quickly followed by one of a much higher nature. Having heard that one of the Mexican prince's wives was an extraordinary beauty, he enjoined ſome Tepanecan ladies, who were accuſtomed to viſit that princeſs, to invite her to ſpend ſome days with them at Azcapozalco. This being complied with, the tyrant eaſily got an opportunity of raviſhing her, and then ſent her back to her huſband. Chimilpopoca was ſo much affected by this misfortune, that he reſolved to offer himſelf up a ſacrifice to his god. Maxtlaton, however, was reſolved that he ſhould not have even this ſatisfaction. At the very time of the ceremony therefore he ſent a body of troops; who entering Mexico without reſiſtance, carried off the king alive, to the aſtoniſhment of the multitude; and who probably were ſo much confounded by this unexpected adventure, that they did not think of making any reſiſtance.

41
He is viſited in priſon by Nazahualcajotl.

Chimilpopoca being carried priſoner to Azcapozalco, was confined in a ſtrong wooden cage, the common priſon for criminals. Maxtlaton ſtill was not ſatisfied: he wiſhed to get into his hands Nezahualcajotl; and with this view ſent a meſſage to him, pretending that he was willing to come to an agreement with him reſpecting the kingdom of Acolhuacan. Though the prince was well aſſured of the tyrant's treacherous intentions, he went boldly to his palace, preſented himſelf before him, and told him that he had heard of the impriſonment of the king of Mexico, he had heard alſo that he wiſhed to take away his own life; he deſired him to do ſo, and to gratify his malice. Maxtlaton was ſo ſtruck with this ſpeech, that he aſſured the prince he had not formed any deſign againſt his life; and that he neither had put to death the king of Mexico, nor would do ſo. He then gave orders for his being properly entertained, and even allowed him to pay a viſit to the king of Mexico in priſon. The unfortunate Chimilpopoca, after reciting his misfortunes, requeſted the prince not to return to court, where they would certainly fail upon ſome project for taking away his life: and having pathetically recommended to him the care of his ſubjects, made him a preſent of a gold pendant and ſome other jewels he wore; after which they took a laſt farewell.

42
Adventures of that prince.

Chimilpopoca languiſhed in priſon for ſome little time after the departure of Nezahualcajotl; but life became at laſt ſo intolerable to him, that he hanged himſelf in his girdle. His voluntary death, in ſpite of all that the tyrant had done to prevent it, ſo exaſperated the latter, that he reſolved upon the death of the prince at all events, whether in the way recommended by his father or not; to which it is not improbable that he was likewiſe inſtigated to this by certain predictions of the prieſts. He ſent out four captains, therefore, with a ſmall party of troops, in queſt of the fugitive prince, with orders to kill him as ſoon as they overtook him. Theſe meſſengers of death ſet out directly for Tezcuco, where the prince happened to be at that time playing at foot-ball; for he ſpent great part of his time in ſuch diverſions, that he might remove all ſuſpicions of his aſpiring to the throne; and thus he had an opportunity of carrying on his negociations without moleſtation. As he knew the errand on which the Tepanecan captains came, he left off his play on their appearance, and retired to his inner apartment. On being informed that they inquired for him, he ſent for anſwer that he would wait upon them after they had repoſed and refreſhed themſelves. The prince made uſe of this opportunity to quit the houſe, and retire by a ſecret door; or, according to Torquemada, by a kind of labyrinth which he had conſtructed, and through which none but himſelf knew the way. He then fled to Coatlichan, a ſmall ſettlement of weavers, who were all exceedingly attached to him. He was purſued thither by the aſſaſſins, who had been informed by a countryman of the road he had taken; but ſuch was the inviolable fidelity of the inhabitants, that ſeveral of them ſuffered themſelves to be put to death rather than diſcover the place of his concealment. Leaving this place, therefore, they went thro' the country in queſt of him; and no ſooner were they gone, than the prince ſet out in a way directly contrary to that which they had taken. Being purſued in all directions, however, he was in the utmoſt danger, and would once have been made priſoner if ſome countrymen had not concealed him under an heap of chia. Having eſcaped this danger, he went to a pleaſant villa at Tezcotzinco, belonging to his anceſtors; where he was met by ſix lords who had left their ſtates. Having conſulted with them, it was determined to apply to the Chalceſe, although they knew that they were an unfaithful and treacherous people, and had been concerned in the death of the late king. He was then met by ambaſſadors from the Cholulans, who offered him their aſſiſtance againſt the uſurper. In a ſhort time he was joined by numbers of others; ſo that he was not only no longer in danger of his life, but began to be formidable to his enemies.

43
Itzcoatl raiſed to the throne of Mexico, who aſſiſts Nezahualcajotl.

In the mean time, the Mexicans, who had ſuffered many injuries ſince the death of Chimilpopoca, raiſed to the throne Itzcoatl, the ſon of Acamapitzin, by a ſlave, and who was accounted the moſt prudent, juſt, and brave, of all the Mexican nation. His election was no leſs pleaſing to Nezahualcajotl and his party, than it was offenſive to Maxtlaton. An alliance was quickly concluded between the exiled prince and the king of Mexico; and this was ſoon followed by the commencement of hoſtilities on the part of the former. His firſt enterpriſe was againſt the city of Tezcuco, which he determined to take by aſſault, but was prevented by the ſubmiſſion of the inhabitants. He put to death, however, all the officers eſtabliſhed by the tyrant: and all the Tepanecans he found there. The very ſame day another large city named Acolman was furiouſly attacked by a detachment of his army; great numbers put to the ſword, and among the reſt the governor, who was brother to Maxtlaton; and the ſame day alſo Coatlichan was taken by the Chalceſe.

44
Dangerous embaſſy undertaken by Montezuma.

The Mexican monarch, hearing of the ſucceſſes of his ally, ſent an embaſſy to congratulate him upon them. His ambaſſador was a ſon of king Huitzilihuitl, named *Montezuma*, who for his invincible courage and great qualities was ſurnamed the *man of great heart and the archer of heaven.* The journey was extremely dangerous; but Montezuma undertook it without any fear, accompanied by another nobleman. They got in ſafety to the place where the prince was; but had the misfortune to be taken priſoners, and were carried to Chalco; the lord of which city, named Toteotzin, was an inveterate enemy to the Mexicans. By him he was immediately put in cloſe confinement, under the care of one Quateozin, who was inviolably attached to the Mexican intereſt. Orders were given to the latter to provide no ſuſtenance for the priſoners but what was preſcribed by his lord, until the mode of death which they were to ſuffer ſhould be determined. Toteotzin then, with a view to flatter the Huexotzincas, ſent his priſoners to them, that they might be ſacrificed there if they thought proper. Theſe people, however, rejected the propoſal with diſdain; on which Toteotzin,

zin, thinking to regain the favour of Maxtlaton, notwithſtanding his treachery in abandoning his cauſe, informed him of the priſoners he had in his poſſeſſion. But Maxtlaton (whoſe character ſeems not to deſerve all the reproaches with which it is loaded) called him a double-minded traitor, and commanded him inſtantly to ſet the priſoners at liberty. Before this anſwer arrived, however, Quateozin had inſtructed the priſoners how to make their eſcape, and directed them alſo not to return by land leſt they ſhould again be intercepted, but to embark at a certain place, and proceed by water to Mexico. They followed his advice exactly; and having got to the place to which they were directed, arrived ſafely at their city, to the great ſurpriſe and joy of the inhabitants.

45
Maxtlaton declares war againſt Mexico.

Toteotzin, enraged at the loſs of his priſoners, put Quateozin to a cruel death, deſtroying alſo all his family excepting one ſon and daughter; of whom the latter fled to Mexico, where ſhe was highly honoured on her father's account. Maxtlaton, too, notwithſtanding his generoſity to the priſoners (which Clavigero derives from mere oppoſition to Toteotzin), prepared to wage a formidable war with the Mexicans, who had agreed to unite their troops with thoſe of the prince. The Mexican populace, terrified at engaging ſo powerful an enemy, demanded that their king ſhould ſubmit and beg for peace. So great was the tumult, that the king himſelf was obliged to conſent; and it required the utmoſt exertions of Montezuma's eloquence to perſuade the people to agree to a commencement of hoſtilities. This being done at laſt, the king next called together the chief nobility, and aſked which of them would have the courage to carry an embaſſy to the king of the Tepanecans? This adventure appeared ſo hazardous, that all of them kept a deep ſilence until Montezuma declared himſelf willing to undertake the arduous enterpriſe. He was ordered to propoſe peace to Maxtlaton, but to accept of no diſhonourable conditions; to which he punctually adhered. Maxtlaton refuſed to give any immediate anſwer, but promiſed to give one next day, after he had conſulted his nobility. Montezuma, dreading ſome treachery if he ſtaid all night, promiſed to return next day; which he did, and was told that Maxtlaton had determined upon war. Montezuma then performed the ceremony of challenging him, by preſenting him with certain defenſive weapons, anointing his head, and fixing feathers upon it, as was cuſtomary to do with dead perſons. Laſtly, he proteſted, in the name of his maſter, that as Maxtlaton would not accept of the offered peace, he and all the Tepanecans would infallibly be ruined. Maxtlaton ſhowed not the leaſt ſign of diſpleaſure, but gave Montezuma arms in like manner to preſent to the king of Mexico; and directed him, for his perſonal ſecurity, to return in diſguiſe through a ſmall outlet from the palace. Montezuma followed his advice; but as ſoon as he found himſelf out of danger, began to inſult the Tepanecan guards; and though they ruſhed violently upon him, he not only eſcaped from their attacks, but killed one or two of them.

On his return to Mexico, the populace were again thrown into the utmoſt conſternation by the news that war was inevitable, as the chiefs of the two nations had challenged one another. They now requeſted the king to allow them to retire from their city, of which they ſuppoſed the ruin to be certain. The king encouraged them with the hopes of victory. "But if we are conquered (replied they), what will become of us?" "If that happens (anſwered the king), we are that moment bound to deliver ourſelves into your hands, to be made ſacrifices at your pleaſure." "Be it ſo (replied they), if we are conquered; but if we obtain the victory, we and our deſcendents are bound to be tributary to you; to cultivate your lands and thoſe of your nobles; to build your houſes; and to carry for you, when you go to war, your arms and baggage."

46
He is defeated and killed.

Matters being thus ſettled, intelligence was ſent to prince Nezahualcajotl to repair with his army to Mexico, which he did without delay; and the day after his arrival a furious engagement took place. The Tepanecan army was commanded by a general named *Mazatl;* Maxtlaton himſelf not judging it proper to quit his capital. The ſoldiers on both ſides fought with the utmoſt bravery; but towards night the Mexicans, diſheartened by ſeeing the army of their enemies continually increaſing in number, began once more to loſe their courage and talk of ſurrendering. The king, greatly concerned, aſked Montezuma what ſhould be done to diſſipate the fears of the people? That brave prince replied, that they muſt fight till death; that if they died with their arms in their hands, it would be honourable; but to ſurvive their defeat, would be eternal ignominy. Nothing could be more ſalutary than this advice at ſo critical a juncture: for the Mexicans were already begun to implore the mercy of their enemies, and to promiſe to ſacrifice their chiefs, whoſe ambition had brought the whole nation into ſuch a dilemma. On hearing this, the whole body of nobility, with the king and Montezuma at their head, aſſaulted the enemy ſo furiouſly, that they repulſed them from a ditch of which they had taken poſſeſſion; after which, Montezuma, happening to encounter Mazatl the Tepanecan general, ſtruck him ſuch a blow on the head that he fell down lifeleſs. Thus the Mexicans were inſpired with freſh courage, and their enemies proportionally diſpirited: however, they retired for that night to the city, in ſome hopes of being able to retrieve their fortune next day. Maxtlaton encouraged them by every method in his power; but fortune proved ſtill more unfavourable than the day before. The Tepanecans were now entirely defeated, and the city of Azcapozalco taken. Maxtlaton, who ſeems not to have had the courage to fight, had not now the preſence of mind to fly. He attempted indeed to hide himſelf; but being quickly diſcovered, he was beaten to death with ſticks and ſtones. The city was plundered, the inhabitants butchered, and the houſes deſtroyed by the victors.

47
The Tepanecans entirely reduced.

This victory proved deciſive in favour of the confederates. Every other place of ſtrength in the country was quickly reduced, until the Tepanecans, finding themſelves on the verge of deſtruction, ſent an humble embaſſy to the king of Mexico, requeſting to be taken under his protection, and to become tributaries to him. Itzcoatl received them graciouſly; but threatened them with total extirpation if they violated the fidelity they had ſworn to him. Thus the whole Tepanecan nation was ſubjected to the Mexicans, excepting only the ſtate and city of Cojohuacan, which continued refractory for a conſiderable time.

Itzcoatl, after this extraordinary ſucceſs, took care to have the abovementioned contract ratified between the nobility and common people, by which the latter were bound to perpetual ſervices. Thoſe who had diſcouraged the ſoldiers in time of battle were baniſhed for ever from the ſtate of Mexico; while Montezuma and others who had diſtinguiſhed themſelves by their bravery, were rewarded with lands, as was uſual with other conquerors.

48
Nezahualcajotl made king of Acolhuacan.

Itzcoatl, now finding himſelf firmly ſeated on the throne of Mexico, ſet about performing his engagements to the Acolhuacan prince, by ſeating him on the throne of his anceſtors. Having again joined their armies, they marched againſt Huaxotla, a city which refuſed to ſubmit even though terms of pardon were offered them. Inſtead of this, they raſhly ventured a battle, in which they were entirely defeated; and were then fain to ſend a deputation of their old men, pregnant women, &c. as was cuſtomary in caſes of diſtreſs, to move the enemy to compaſſion. At laſt all obſtacles being removed, Nezahualcajotl was ſeated on the throne of Acolhuacan, the auxiliary troops were diſmiſſed, and Itzcoatl left at liberty to purſue his conqueſts, in which he was ſtill aſſiſted by the king of Acolhuacan. The firſt expedition was againſt Cojohuacan and other two Tepanecan cities, who had not only refuſed ſubmiſſion themſelves, but excited others to ſhake off the yoke alſo. The war againſt them proved bloody. Three battles were fought, in which Itzcoatl gained no other advantage than making the enemy retreat a little; but in the fourth, while the two armies were hotly engaged, Montezuma, with a body of choſen troops, which he had placed in ambuſcade, attacked the rear-guard of the rebels with ſuch vigour, that they were ſoon diſordered, and obliged to fly to the city. The conquerors purſued them thither; and Montezuma perceiving that they intended to fortify themſelves in the greater temple, fruſtrated their deſign by getting poſſeſſion of it and burning the turret. By this diſaſter they were ſo much terrified, that they fled to the mountains ſouth of Cojohuacan; but even there the royal army overtook and purſued them more than 30 miles, till they came to another mountain, where, quite exhauſted with fatigue, and ſeeing no means of eſcape, they were obliged to ſurrender at diſcretion.

49
Conqueſts of the Mexicans.

Having thus happily accompliſhed the conqueſt of Cojohuacan and the other rebellious cities, the two kings returned to Mexico. Itzcoatl gave great part of the Tepanecan country to *Totoquihuatzin*, with the title of king of *Tacuba*, a grandſon of Tezozomoc, but who does not appear to have been any way concerned in his projects againſt the Mexicans. An alliance was then formed among the three kings on the following terms: The king of Tacuba held his crown on condition of ſerving the king of Mexico with all his troops, at any time when required; for which he was to have a fifth part of the ſpoils taken from the enemy. The king of Acolhuacan was likewiſe to aſſiſt the king of Mexico in war; and for this he was to have a third part of the plunder, after deducting the ſhare of the king of Tacuba; and the remainder was to belong to the king of Mexico. The kings of Tacuba and Acolhuacan were both declared honorary electors of the kings of Mexico; the real electors being four nobles: and the king of Mexico was likewiſe bound to aſſiſt in the wars of his allies whenever it was demanded.

50
Alliance between the kings of Mexico, Acolhuacan, and Tepaneca.

After having thus ſettled matters among themſelves, and rewarding their ſoldiers, Itzcoatl ſet out with Nezahualcajotl for Tezcuco, where the Acolhuacan king was crowned with all poſſible ceremony. Here the new king took every method which prudence could ſuggeſt to eſtabliſh his authority on a permanent baſis; but while he was thus employed, the Xochimilcas, fearing leſt the Mexicans might conquer their country as they had done that of the Tepanecans, held a council on what was to be done to prevent ſuch a diſgrace. In this council it was determined to commence hoſtilities againſt that riſing ſtate, before it ſhould become more formidable by new conqueſts.

51
Other conqueſts.

Itzcoatl was no ſooner informed of this determination, than he ſent Montezuma with a great army againſt them. The Xochimilcas met him with one ſtill more numerous; but being worſe diſciplined, they were quickly defeated, and their city taken in a very ſhort time after. This conqueſt was followed by the reduction of Cuitlahuac, ſituated on a ſmall iſland on the lake of Chalco. Their inſular ſituation gave them confidence to attack the formidable power of the Mexicans. The king was ſo ſenſible of the difficulty of this enterpriſe, that he propoſed to attack them with the whole force of the alliance: Montezuma, however, with only a ſmall number of men of his own training, whom he furniſhed with proper veſſels, reduced them in ſeven days.

Theſe conqueſts were followed by the reduction of the cities of Quauhnahuac, Quantitlan, and Toltitlan; the firſt of which was ſo ſtrong, that Itzcoatl was obliged to call in his allies to his aſſiſtance. In ſhort, in the ſpace of twelve years, Mexico, from being a contemptible and tributary ſtate, became able to command thoſe whom it had formerly ſerved, and who thought themſelves very much ſuperior in every reſpect.

52
Montezuma I. king of Mexico.

Itzcoatl died in the year 1436, at a very advanced age, in the height of proſperity, and was ſucceeded by Montezuma I. the greateſt monarch that ever ſat on the Mexican throne. Before his coronation, in order to comply with the barbarous rites of his religion, he made war upon the Chalceſe in order to procure the priſoners who were to be ſacrificed at his coronation; and ſcarce was this ceremony over, than a new war commenced, which terminated in the deſtruction of that city. This quarrel happened between the Chalceſe and the Tezcucans. Two of the royal princes of Tezcuco having gone a-hunting on the mountains which overlook the plains of Chalco, while employed in the chace, and ſeparated from their retinue, with only three Mexican lords, fell in with a troop of Chalceſe ſoldiers; who, to gratify the cruelty of their maſter, carried them all priſoners to Chalco. The cruel and inconſiderate tyrant who commanded there inſtantly put them all to death; after which he cauſed their bodies to be ſalted, dried, and placed in an hall of his palace, where they ſerved as ſupporters to the pine torches burned there for light every evening. The king of Tezcuco, overwhelmed with

53 Chalco taken.

with grief, and to the laſt degree exaſperated at ſuch an inhuman act, called for the aſſiſtance of the allied kings. The city was attacked at once by land and water. The inhabitants, knowing that they had no mercy to expect, fought like men in deſpair. Even the old tyrant who commanded them, though unable to walk, cauſed himſelf to be carried in a litter among the combatants; notwithſtanding which they were totally defeated, and the moſt ſevere vengeance executed upon them.

54 Tlatelolco reduced, and Moquihuix made king.

55 Atonaltzin defeated, and the Mexican dominions enlarged.

Montezuma, on his return found himſelf obliged to encounter an enemy more formidable on account of his vicinity than more powerful ones at a diſtance. This was the king of Tlatelolco, who had formerly conſpired againſt the life of Itzcoatl; and finding himſelf diſappointed in this had tried to reduce his power by entering into a confederacy with ſome of the neighbouring lords. At that time his deſigns proved abortive, but he reſumed them in the time of Montezuma; the conſequence of which was, that he was defeated and killed. One *Moquihuix* was choſen in his room; in whoſe election it is probable that Montezuma had a conſiderable ſhare. This was followed by conqueſts of a much more important nature. The province of *Cuihixcas*, lying to the ſouthward, was added to his dominions, comprehending a tract of country more than 150 miles in breadth; then, turning to the weſtward, he conquered another named *Tzompahacuan*. This ſucceſs, however, was for a ſhort time interrupted by a war with Atonaltzin, lord of a territory in the country of the Mixtacas. This prince, puffed up on account of the great wealth he poſſeſſed, took it into his head that he would allow no Mexican to travel through his country. Montezuma ſent ambaſſadors to know the reaſon of ſuch ſtrange conduct; but Atonaltzin gave them no other anſwer than ſhowing them ſome part of his wealth, making a preſent to the king, and deſiring him from thence to obſerve how much the ſubjects of Atonaltzin loved him; and that he willingly accepted of war which was to determine whether he ſhould pay tribute to the Mexicans or the Mexicans to him. Montezuma having informed his allies of this inſolent anſwer, ſent a conſiderable army againſt Atonaltzin, but had the mortification to be informed of its defeat; in conſequence of which the pride of Atonaltzin was increaſed to a great degree. Montezuma, greatly chagrined at this firſt check, determined to head his next army in perſon; but before he could call together another, Atonaltzin had drawn into a confederacy with him the Huexotzincas and Tlaſcalans, who were glad of the opportunity, as they ſuppoſed, of reducing the power of the Mexicans. Their numbers however, availed but little; Montezuma in the very firſt engagement totally defeated the confederate army. The allies of Atonaltzin were particularly unfortunate; for ſuch of them as were not killed in the field of battle, were deſtroyed by their own party out of revenge for the unfortunate event of the battle.

By this victory the Mexican monarch became maſter not only of the dominions of Atonaltzin, but of many other neighbouring princes, againſt whom he made war on account of their having put to death ſome Mexican merchants or couriers without any juſt cauſe. The conqueſt of *Cuetlachtlan* or *Cotaſtla*, however, which he attempted in 1457, proved a much more difficult taſk. This province lies on the coaſt of the Mexican gulph, and had been formerly inhabited by the Olmecans, whom the Tlaſcalans had driven out. The inhabitants were very numerous; but dreading the power of Montezuma, called in thoſe of Tlaſcala, together with the Huexotzincas, to their aſſiſtance. Along with theſe the allies drew the Cholulans alſo into the confederacy; ſo that this appears to have been the moſt formidable combination that had yet been formed againſt the Mexican power. Montezuma collected an excellently equipped army; which, however, he did not on this occaſion command in perſon. It contained a great number of perſons of very high rank, among whom were three princes of royal blood, and *Moquihuix* king of Tlatelolco already mentioned. The combination of the three republics againſt Mexico was not known at court when the army ſet out; but Montezuma, being informed of it ſoon after, ſent an order to his generals to return. This accorded ſo ill with the romantic notions of valour entertained by the Mexicans, that a conſultation of the generals was held whether they ſhould obey it or not. At laſt it was determined that the king's order ſhould be obeyed; but no ſooner was this agreed to than Moquihuix accuſed them all of cowardice, and threatened, with his own troops, unaſſiſted, to go and conquer the enemy. His ſpeech had ſuch an effect upon them all, that they went to meet the confederates. The Cotaſteſe fought with great valour, but were unable to reſiſt the royal forces; and their allies were almoſt totally deſtroyed. Six thouſand two hundred of them were taken priſoners, and ſoon after ſacrificed to the Mexican god of war in the barbarous manner already deſcribed. The victory was ſaid to have been owing principally to the valour and good conduct of Moquihuix, inſomuch that to this day a ſong made in his praiſe on that occaſion is known in Mexico. Montezuma was ſo well pleaſed with the victory, that he not only forgave the diſobedience of his orders, but beſtowed upon Moquihuix a princeſs, one of his own couſins, to wife.

56 Chalceſe rebel, and are deſtroyed.

The next exploit of this great warrior was the entire deſtruction of the Chalceſe, whoſe reſtleſs diſpoſition continually brought miſchief upon themſelves. They had, it ſeems, formed a deſign of making their city a rival to Mexico; and with this view had taken priſoner one of the brothers of Montezuma himſelf, whom they attempted to make their ſovereign abſolutely againſt his own inclination. The prince, finding it impoſſible to reſiſt, pretended to comply with their wiſhes; but that the act of exalting him to this dignity might be more conſpicuous, he deſired them to plant in the market place one of the higheſt trees, and place a ſcaffold upon it, from whence every body might ſee him. This being done, the Mexicans who had been taken along with him aſſembled round the tree; and the prince having aſcended the ſcaffold with a bunch of flowers in his hand, addreſſed them to the following purpoſe: "Ye know well, my brave Mexicans, that the Chalceſe wiſh to make me their king; but it is not agreeable to our god that I ſhould betray our native country; I chooſe rather to teach you, by my example, to place higher value on fidelity to it than on life itſelf." With theſe words he threw himſelf from the ſcaffold, and was killed. The Chalceſe were ſo enraged at this, that they inſtantly fell upon the Mexicans and killed them with their darts. Next evening they were terrified by a ſcreech owl; the diſmal voice of which animal they interpreted into an omen of their approaching ruin. They were not deceived in their predictions, which indeed they might have made without any ſcreech-owl. They were quickly attacked by Montezuma; who on this occaſion was ſo much exaſperated, that he cauſed fires to be lighted on the tops of the adjacent mountains, as ſymbols of the puniſhment to which he condemned the rebels. The havock he made among them was ſuch, that the province was almoſt depopulated. Vaſt numbers were ſlaughtered, while thoſe who eſcaped with life fled into the caves of the neighbouring mountains. Some fled into diſtant countries, leaving their city to be deſtroyed by the enemy. At laſt Montezuma, ſatiated with revenge, proclaimed a general pardon, and invited the fugitives to return; but many of them, not putting any confidence in his ſincerity, choſe to remain in their ſtate of exile. The remainder of this emperor's reign was taken up in making new conqueſts; ſo that by the time of his death, which happened in 1464, he had extended his dominions as far as the gulf of Mexico on the eaſt; to the middle of the country of the Mixtecas on the ſouth-eaſt; ſomething farther than Chilapan on the ſouth; to the valley of Toluca on the weſt; the centre of the country of the Otomies on the north-weſt; and, on the north, to the extremity of the vale of Mexico.

57
Inundation and famine at Mexico.

During the reign of this great monarch a violent inundation happened in Mexico. The lake, ſwelled by the exceſſive rains which fell in the year 1446, poured its waters into the city with ſo much violence that many houſes were deſtroyed, and the ſtreets inundated to ſuch a degree that boats were every where made uſe of. To prevent accidents of this kind for the future, Montezuma, by the advice of the king of Tezcuco, conſtructed a great dyke nine miles in length, eleven cubits in breadth, and conſiſting of two parallel lines of palliſades, the interval betwixt which was filled up with ſtones and ſand. The greateſt difficulty in the conſtruction lay in being obliged occaſionally to work in the lake itſelf, which in ſome places was of conſiderable depth; but this was ſurmounted by the ſkill and perſeverance of the workmen. The dyke, when conſtructed, proved of great ſervice in keeping out the waters, though it did not entirely remedy the evil; nor indeed have the Spaniards been able to ſecure this city effectually from inundations, after being in poſſeſſion of it for more than two centuries.

The inundation was ſoon followed by a famine. This was occaſioned by the ſtinting of the crop of maize in 1448; the ears while young and tender being deſtroyed by froſt. In 1450 the crop was totally loſt for want of water; and in 1451, beſides the unfavourable ſeaſons, there was a ſcarcity of ſeed. Hence, in 1452, the neceſſities of the people became ſo great, that they were obliged to ſell themſelves for ſlaves in order to procure ſubſiſtence. Montezuma permitted them to go to other countries for ſupport; but being informed that many ſold themſelves for a few days proviſion, he ordered by proclamation, that no woman ſhou'd ſell herſelf for leſs than 400 ears of wheat, nor any man for leſs than 500. He opened alſo the public granaries for the relief of the lower claſſes; but nothing was able to ſtop the progreſs of the famine. Many who went for relief to other countries periſhed with hunger on their journey; and great numbers who ſold themſelves for ſlaves never returned to their native country. Moſt of the populace ſupported themſelves, like their anceſtors, on the produce of the lake, until all their diſtreſſes were relieved by a moſt plentiful harveſt in the year 1454.

58
Axayacatl ſucceeds Montezuma.

Montezuma was ſucceeded by Axayacatl, who like his predeceſſor inſtantly commenced a war, for no other reaſon than that he might have priſoners to ſacrifice at his coronation. The people whom he now attacked inhabited the province of *Tecuantepec* on the coaſt of the Pacific Ocean, and ſituated at 400 miles diſtance from the city of Mexico. A very deſperate battle enſued on this occaſion, in which, however, the Mexicans at laſt prevailed; and, beſides the poor wretches doomed to deſtruction whom they carried off, acquired a conſiderable ſpoil, as well as a tract of territory extending to Coatulco, a maritime place much frequented in the next century by the Spaniards.

59
His conqueſts.

Axayacatl purſued Montezuma's plan of conqueſt; in which, however, he was leſs ſucceſsful, many of the provinces reduced by that monarch having revolted after his death, ſo that it was neceſſary to reconquer them. On his returning ſucceſsful from one of theſe expeditions, he built a new temple, to which he gave the name of *Coatlon;* but the Tlatelolcos, whoſe ancient rivalſhip ſeems to have revived on the death of Montezuma, built another in oppoſition, which they called *Coaxolotl.* Thus the former hatred between the two nations was renewed, and a diſcord took place which ended in the ruin of the Tlatelolcos.

60
Death of the kings of Acolhuacan and Tacuba.

The Mexicans ſuſtained an irreparable loſs in 1469 and 1470 by the death of their allies the kings of Tacuba and Acolhuacan; for though the league which had been concluded between the three nations continued without any violation till the arrival of the Spaniards, we cannot ſuppoſe that any of the ſucceſſors of the Tacuban and Acolhuacan princes would have the ſame cordial affection for thoſe of Mexico which was entertained by theſe who lay under ſuch great obligations to Montezuma. The king of Tacuba was ſucceeded by his ſon Chimalpopoca, and the Acolhuan monarch by his ſon Nezahualpilli. A ſhort time after the acceſſion of the latter, the war broke out between the Tlatelolcos and Mexicans, which ended in the deſtruction of the former. King Moquihuix had been married by Montezuma to a ſiſter of Axayacatl, now on the throne of Mexico; but it appears that this princeſs never was greatly the object of his affection. On the contrary, he took all methods of expreſſing his diſlike, either out of enmity to herſelf, or envy of the ſuperior greatneſs of her brother. Not content with this, he entered into an alliance with a great number of the neighbouring ſtates, in order to reduce the Mexican greatneſs. His wife, however, being informed of this ſcheme, communicated the particulars to her brother; and ſoon after, being impatient of the ill uſage ſhe received, came to Mexico with her four ſons to claim the protection of her brother. This

61
Tlatelolco reduced and the king killed.

uncommon accident exaſperated the Mexicans and Tlatelolcans againſt each other to ſuch a degree, that wherever they met, they fought, abuſed, and murdered each other. The king of Tlatelolco prepared for war with many horrid ceremonies, of which the drinking of human blood was one. A day was appointed for attacking Mexico. Xiloman, lord of Colhuacan, was to begin the attack, afterwards to pretend flight, in order to induce the Mexicans to follow him; after which the Tlatelolcos were to fall upon their rear. For ſome reaſon, however, with which we are not acquainted, the Tlatelolcos began the attack without waiting for Xiloman; the conſequence of which was, that he retired in diſguſt, leaving them to finiſh their battle the beſt way they could. The engagement laſted till night, when the Tlatelolcos were obliged to retire. Axayacatl, during the night, diſpoſed of his troops in all the roads which led to Tlatelolco, appointing them to meet in the market-place. The Tlatelolcos, finding themſelves attacked on all ſides, retired gradually before the Mexicans, until at laſt they were forced into the market-place, where they found themſelves worſe than ever on account of its narrowneſs, which did not allow them room to act. The king ſtood on the top of the great temple, encouraging his men to exert themſelves againſt the enemy. His words, however, had now loſt their uſual influence. He not only was not obeyed, but was reproached with cowardice becauſe he did not come down and fight among the reſt. At laſt the Mexicans arrived at the temple, and aſcended to the balcony where the king was. He made a deſperate defence for a little; but by a violent puſh in the breaſt was thrown backward upon the ſteps of the temple, and ſtunned or perhaps killed by the fall. The ſoldiers took him up and carried him to Axayacatl; who with his own hand cut open his breaſt and tore out his heart. His people then attempted to fly acroſs the market-place: but a great number of them were killed, among whom were many officers of diſtinction. The city of Tlatelolco was then united with Mexico, as a part or kind of ſuburb, which it ſtill continues to be.

62
Axayacatl wounded and in great danger.

The Tlatelolcos being thus reduced, Axayacatl next ſet out on an expedition againſt the Matlatzincas, a tribe in the vale of Toluca, who ſtill refuſed to ſubmit to the Mexican yoke. Having proved ſucceſsful in this expedition, he undertook to ſubdue alſo the northern part of the valley, now called *Valley d' Ixtlahuacan*, particularly *Xiquipilco*, a conſiderable city and ſtate of the Otomies, whoſe chief was much renowned for ſtrength and bravery. Axayacatl, who likewiſe valued himſelf on theſe qualities, encountered him in ſingle combat. In this, however, he was over-matched, and received a violent wound on the thigh; after which he would have been taken priſoner, had not ſome young Mexicans made a deſperate effort for his reſcue. Notwithſtanding this diſaſter, Axayacatl's army gained a complete victory, carrying off 11060 priſoners, among whom was the chief of the Otomies himſelf, and two of his officers who had attacked the king. Theſe chiefs were put to death at an entertainment of the allied kings, the ſight of their agonies not interrupting in the leaſt the mirth of the feaſt; ſo much were they familiarized to the ſhedding of human blood.

63
Is ſucceeded by Tizoc.

Axayacatl continued to extend his territories to the eaſt and weſt, till his progreſs was ſtopped by death in 1477. He was ſucceeded by his elder brother Tizoc; of whoſe reign we know little, but that he conquered fourteen cities, ſome of which had been in rebellion. He intended to have built a larger temple than any that had yet been ſeen in Mexico, though that originally built had been greatly enlarged by ſome of his predeceſſors. For this purpoſe he collected a great quantity of materials; but before he could bring his projects to bear, he was taken off by a conſpiracy of his ſubjects. We are not informed in what manner he died; moſt probably it was by poiſon, as the conſpirators wiſhed his death to paſs for natural. It being diſcovered to be otherwiſe, however, diligent ſearch was made for the criminals, who were puniſhed according to their deſerts. During the reign of Tizoc, the Alcolhuacans made war upon the Huexotzincas, ruined their city, and conquered their territory. Nezahualpilli alſo, the Acolhuacan monarch, though he had already ſeveral wives, had not made any of them queen, having wiſhed to confer that honour upon one of the royal family of Mexico. Tizoc readily gave him one of his grand-daughters, who had a ſiſter of ſingular beauty named *Xocotzin*. The friendſhip betwixt theſe two ladies was ſuch, that the one could not think of being ſeparated from the other; for which reaſon the new queen ſought and obtained permiſſion to take her ſiſter along with her to Tezcuco. Xocotzin had not been long there before the king fell in love with her, and married her with the title of queen likewiſe. Soon after this ſecond marriage, the firſt queen brought forth a ſon named *Cacamotzin*, who ſucceeded him in the throne, and was afterwards taken priſoner by the Spaniards.

64
Ahuitzotl dedicates a temple with a multitude of human victims.

Ahuitzotl, the brother of Tizoc, ſucceeded him in the kingdom of Mexico. His firſt object was to finiſh the great temple begun by his predeceſſor; and ſuch was the number of workmen, that it was completed in four years. During the time that it was building, the king employed himſelf in making war with different nations, reſerving all the priſoners he took for victims at the dedication of the temple. The number of priſoners ſacrificed at this dedication is ſaid by Torquemada to have been 72,324; by other hiſtorians 64,060. The miſerable victims were ranged in two files, each a mile and an half in length, terminating at the temple. The ſame year another temple was built by a feudatory lord, in imitation of the great one built by the king; at the dedication of which a vaſt number of priſoners were alſo ſacrificed. Theſe temples were dedicated in 1486. In 1487 happened a violent earthquake; and Chimalpopoca king of Acolhuacan died, who was ſucceeded by Totequihuatzin II.

65
His conqueſts.

The remainder of the life of Ahuitzotl was a continued ſeries of wars, in all of which he proved ultimately ſucceſsful, extending the Mexican dominions as far as Guatimala, 900 miles to the ſouth-eaſt of Mexico. In only one expedition the Mexicans were defeated with diſgrace. This happened in 1496, when they ſuddenly, and as appears without any provocation, entered the vale of Atlixco in an hoſtile

manner,

Mexico.

manner. So unexpected was the invaſion, that the inhabitants of Atlixco knew only of the intention of their enemies by ſeeing them in arms in their country. Finding it impoſſible to raiſe in an inſtant a ſufficient force among themſelves, they applied to their neighbours, the Huexotzincas. On their arrival at the city, which it ſeems had already been rebuilt ſince its deſtruction by the Acolhuacans, they found a moſt celebrated captain, named Toltecatl, amuſing himſelf at foot-ball. Being informed of the arrival of the Mexican army, he inſtantly quitted his diverſion to repair to Atlixco; where, to ſhow his contempt for the enemy, he entered the battle unarmed.—He ſupplied himſelf with armour by knocking down the firſt Mexican he met with his fiſt, and ſeizing his armour. He then attacked the enemy with ſuch fury, and was ſo well ſeconded by his troops, that the Mexicans were totally defeated; and, in conſideration of his ſignal bravery, the Huexotzincas made him the chief of their republic. He had not continued in his new office more than a year, however, when, finding himſelf unqualified for being legiſlator to ſuch turbulent ſubjects as he had to deal with, he quitted his dignity and his country at once; and croſſing the mountains with ſome other nobles, came to Tlalmanalco, where he was put to death, with all his companions, by order of Ahuizotl.

66 His death.

Ahuizotl died in 1502, of a diſorder produced by a contuſion in his head. Of the cauſe of which we have the following account: In 1498, the king, thinking that the navigation of the lake of Mexico was become difficult on account of the ſcarcity of water, formed a project of ſupplying the deficiency from a fountain which ſupplied the Cojoacaneſe, and called upon the lord of the diſtrict to give orders for that purpoſe. This nobleman repreſented that the ſpring was not conſtant; that ſometimes it was dry, and at others ran ſo abundantly that it might occaſion ſome diſaſter in his court. Ahuizotl, however, ſuppoſing this to be a pretence, renewed his order, and put the nobleman to death for inſiſting upon his objection. He then cauſed a ſpacious aqueduct to be conſtructed from Cojoacan to Mexico; and the water was brought in with a great many ſuperſtitious ceremonies. That very year, however, there fell ſuch quantities of rain, that the waters of the lake, augmented alſo by thoſe of the ſpring, overflowed the city, ſo that the ſtreets were filled with ſailing veſſels, and ſome houſes were deſtroyed. The king happening to be one day in a lower apartment of his palace, the waters entered with ſuch rapidity and violence that he was obliged to fly; and the door being low, he ſtruck his head with ſuch force againſt the top, that he never recovered the effects of the contuſion. This inundation was followed by a famine, all the maize being rotted by the water.

67 Montezuma II.

At the time of Ahuizotl's death, the Mexican empire was brought to its utmoſt extent. His ſucceſſor, Montezuma *Xocojotzin*, or Montezuma *Junior*, was a perſon of great bravery, beſides which he was likewiſe a prieſt, and held in great eſtimation on account of his gravity and the dignity of his deportment. His election was unanimous; and the nobles congratulated themſelves on the happineſs the country was to enjoy under him, little thinking how ſhort the duration of their happineſs or of their empire was to be.

The firſt care of the new monarch, as uſual, was to procure victims for the barbarous ſacrifices to be made at his coronation. The people of Atlixco, who had again ſhaken off the Mexican yoke, were the ſufferers on this occaſion, being once more reduced, though not without great loſs on the part of the Mexicans, ſome of whoſe braveſt officers periſhed in the war. The ceremony of coronation was performed with ſuch pomp as had never been ſeen before in Mexico; but no ſooner was this ceremony over than Montezuma began to diſcover a pride which nobody had ſuſpected before. All his predeceſſors had been accuſtomed to confer offices upon perſons of merit, and thoſe who appeared the moſt able to diſcharge them, without any partiality as to birth or wealth. Montezuma, however, diſapproved of the conduct of his predeceſſors, under pretence that the plebeians ſhould be employed according to their rank; for that in all their actions the baſeneſs of their birth and the meanneſs of their education appeared: and in conſequence of this maxim he deprived all the commoners of the offices they held about the court, declaring them incapable of holding any for the future. All the royal ſervants now were people of rank. Beſides thoſe who lived in the palace, 600 feudatory lords and nobles came to pay court to him. They paſſed the whole day in the antichamber, where none of their ſervants were permitted to enter; converſing in a low voice, and waiting the orders of their ſovereign.—The ſervants of theſe lords were ſo numerous that they occupied three ſmall courts of the palace, and many waited in the ſtreets. The women were not leſs numerous. All theſe laſt were confined in one vaſt ſeraglio, under the care of ſome noble duennas, who kept a ſtrict watch over their conduct. From this collection the emperor ſelected ſuch as he liked beſt for himſelf, giving away the reſt; and ſo well did he acquit himſelf in his matrimonial capacity, that *an hundred and fifty* of his wives are ſaid to have been pregnant at once.

68 His exceſſive haughtineſs.

The pride of Montezuma was no leſs conſpicuous in the ceremonials than in the magnificence of his court. None durſt enter the palace without pulling off his ſhoes and ſtockings at the gate; neither durſt they appear pompouſly dreſſed in the imperial preſence; this being deemed a want of reſpect to majeſty.—All who entered the hall of audience, before ſpeaking to the king, made three bows; at the firſt, ſaying *Lord!* at the ſecond, *My Lord!* and at the third, *Great Lord!* They ſpoke low, and with the head inclined, receiving the anſwer which the king gave them by ſecretaries, with as great humility as if it had been the voice of a deity; and no perſon in taking leave ever turned his back on the throne. When this mighty emperor went abroad, he was carried on the ſhoulders of the nobility, in a litter covered with a rich canopy, and attended by a numerous retinue of courtiers: and wherever he paſſed, every perſon ſhut their eyes, as fearing to be dazzled with the ſplendor of Majeſty. When he alighted from the litter to walk on foot, carpets were ſpread on the ground, that the emperor might not be permitted to touch the earth with his feet.

[68] Magnificence diſplayed in his palace.

In every reſpect Montezuma kept up, as far as was poſſible, this extravagant appearance of dignity. His kitchen-utenſils were of the fineſt earthen ware, and his table-cloths and napkins of the fineſt cotton; but none of theſe ever ſerved the emperor more than once, being immediately made a preſent of to ſome nobleman. The veſſels in which his chocolate and other drinks from cocoa were prepared, were all of gold, or ſome beautiful ſea-ſhell, or naturally formed veſſels, curiouſly varniſhed. He had alſo gold plate, but it was uſed only on particular occaſions in the temple. The number and variety of his diſhes aſtoniſhed the Spaniards. Cortes ſays, that they covered the floor of a great hall; and that there were diſhes of every kind of game, fiſh, fruit, or herbs, in the country. This dinner was carried in ſtate by three or four hundred of the young nobility, who retired as ſoon as the king ſat down to table: and that the meat might not grow cold, each plate was furniſhed with a chaffing-diſh. The king marked with a rod the diſhes he choſe for himſelf, and the reſt were diſtributed among the nobility in the antichamber. Before he ſat down, four of the moſt beautiful women of his ſeraglio ſupplied him with water to waſh his hands, and continued ſtanding all the time of his dinner, along with ſix of his principal miniſters and his carvers.

Montezuma took great delight in the cleanlineſs of his perſon, and of every thing about him. He bathed regularly every day, and had baths in all his palaces. Every day he wore four dreſſes, never uſing again thoſe which he had put off, but reſerving them as largeſſes for the nobility, or thoſe who had diſtinguiſhed themſelves in war.

69 Diſpleaſes his ſubjects.

The expence of all this, and many other inſtances of magnificence, rendered the emperor very diſagreeable to a great number of his ſubjects; though others were pleaſed with the readineſs he ſhowed to relieve the neceſſities of individuals, and his generoſity in rewarding his generals and miniſters who deſerved it.—Among other actions worthy of imitation, he appointed the city of Colhuacan as an hoſpital for all invalids, who, after having faithfully ſerved the crown, either in the civil or military line, required a proviſion on account of their age and infirmities. In this place they were maintained and attended at the expence of the king.

70 His unſucceſsful war with Tlaſcala.

The reign of Montezuma, even before the arrival of the Spaniards, was far from being ſo glorious with regard to his ſucceſſes in war as thoſe of his predeceſſors had been. He reduced indeed one rebellious province, and conquered another which had never before been ſubjugated; but in his war with Tlaſcala, he was by no means ſucceſsful. This was but a ſmall republic at no great diſtance from the capital, but the inhabitants were remarkable for their bravery and independent ſpirit. The neighbouring ſtates, however, who had been reduced by the Mexicans, envious of their liberty and proſperity, exaſperated the Mexicans againſt them, by repreſenting that the Tlaſcalans were deſirous of making themſelves maſters of the maritime provinces on the Mexican gulf, and that by their commerce with theſe provinces they were encreaſing their wealth and power, and gaining the hearts of the people with whom they were to traffic. In conſequence of this repreſentation, ſtrong garriſons were placed on the frontiers of Tlaſcala, to obſtruct the commerce of the inhabitants, and thus to deprive them of the means of obtaining ſome of the neceſſaries of life. The Tlaſcalans complained; but received no other anſwer than that the king of Mexico was lord of all the world, and that the Tlaſcalans muſt ſubmit to pay tribute to him. The Tlaſcalans returned a ſpirited anſwer, to this inſolent ſpeech, and began to fortify their frontier.—They had already encloſed all the lands of the republic with entrenchments; and to theſe they now added a wall of ſix miles in length on the weſt ſide, where an invaſion was moſt to be apprehended; and ſo well did they defend themſelves, that though they were frequently attacked by the neighbouring ſtates in alliance with Mexico, or ſubject to it, not one of them was able to wreſt a foot of ground from them. Thus a continual ſeries of wars and engagements took place between the ſtates of Mexico and this republic, which continued till the arrival of the Spaniards. The moſt remarkable occurrences in theſe wars are the exploits of a Tlaſcalan general named Tlahuicol.

71 Exploits and death of Tlahuicol.

His courage and ſtrength were ſo great that his enemies fled wherever he appeared. The ſword with which he fought was ſo weighty, that no man of ordinary ſtrength could lift it from the ground. At laſt, however, having in the heat of an engagement got into a marſh, his great ſtrength was of no uſe to him, ſo that he was taken priſoner, put into a ſtrong cage, and carried to Mexico. The emperor, in conſideration of his extraordinary qualities, gave him liberty to return to his own country: but this he abſolutely refuſed, ſaying, that he wiſhed to die, like other priſoners, in honour of their god. In this he perſiſted obſtinately for ſeveral years; until at laſt Montezuma reſolved to comply with his barbarous deſire; and he was permitted to die by the gladiatorian ſacrifice, to be afterwards deſcribed, in which the priſoner was allowed, though under great diſadvantages, to fight for his life. He was oppoſed by ſeveral brave men, one at a time, of whom he killed eight, and wounded twenty more; until, falling almoſt dead by a violent blow he received on the head, he was carried to the temple, and there ſacrificed.

72 Apprehenſion entertained by the Mexicans of the arrival of a new people.

During the remainder of Montezuma's reign, the empire was diſturbed by various rebellions, of which the accounts are not ſufficiently intereſting to merit a particular detail; but in the year 1508, Montezuma began to entertain apprehenſions of that fatal event which at length overtook him. An expedition having been undertaken againſt a very diſtant region named Amatla, the army, in marching over a lofty mountain, were attacked by a furious north-wind, accompanied with ſnow; which made great havock in the army, many of them periſhing with cold, and others being killed by the trees rooted up by the wind. The remains of the army continued their march to Amatla, where they were almoſt all killed in battle. By this and other calamities, together with the appearance of a comet, the Mexicans were thrown into the utmoſt conſternation. Montezuma was ſo terrified by theſe omens, that, having in vain conſulted his aſtrologers, he applied to the king of Acolhuacan, who was reported to be very ſkilful in divination. Nezahualpilli having conferred with him at length upon the ſubject, told Montezuma, that the comet preſaged ſome calamity which was about to befal their kingdom by the arrival of a new people: but this being unſatisfactory to the emperor, the king of Acolhuacan challenged him to a game at foot-ball, ſtaking the truth of his prediction on the iſſue of the game. Montezuma loſt the game, but did not yet acquieſce in the truth of his prediction. He therefore applied to a celebrated aſtrologer, whom it ſeems he had not yet conſulted; but he confirmed the interpretation of Nezahualpilli; for which the emperor cauſed his houſe to be pulled down, and himſelf buried in the ruins.

73
Story of the reſurrection of a princeſs.

Many other preſages of the arrival of the Spaniards are related. The following, though apparently the moſt incredible of them all, ſeems to be believed by Clavigero. "A ſiſter of Montezuma, named Papantzin, who had been married to the governor of Tlatelolco, lived in his palace after he was dead to the year 1509, when ſhe died of old age. The day after her burial, a child of five or ſix years old happened to paſs from her mother's apartment to that of the major-domo of the deceaſed princeſs. In paſſing by the child ſaw the princeſs ſitting upon the ſteps of the fountain where ſhe had been accuſtomed to bathe, and heard herſelf called by the name of *cocoton*, a Mexican expreſſion of endearment, ſignifying "little girl." The child, incapable from its age of reflecting on the death of the princeſs, approached without fear, and was deſired to call the wife of her major-domo. The woman careſſed the child, and told her that the princeſs was dead; but being importuned and pulled by the gown, ſhe at laſt went; but no ſooner ſaw the princeſs than ſhe fainted. The child then ran to call her mother, who with two other women came to the aſſiſtance of the wife of the major-domo; but they alſo would have fainted, had not the princeſs called to them and aſſured them that ſhe was really alive. Having cauſed them call the major-domo, ſhe deſired him to go and tell Montezuma what he had ſeen. But he, dreading the ſeverity of the emperor, durſt not undertake the taſk. She then deſired him to go to Tezeuco, and tell Nezahualpilli that ſhe wiſhed to ſee him. He came accordingly, and at her deſire brought Montezuma; whom ſhe informed, that during the time ſhe lay entranced, ſhe had ſeen a viſion. The main purport of this viſion was to announce to her, that all her forefathers were damned; that another race of men ſhould arrive, who ſhould conquer the kingdom, and introduce the true religion; and "as ſoon as the bath ſhould be publiſhed and made known, which would waſh away ſin, ſhe ſhould be the firſt to accept of it."

74
The expectation of the Mexicans accounted for.

There can be but very little doubt that this ſtory is a fiction of the Spaniſh prieſts, tho' it cannot be doubted that the Mexicans had ſome expectations of the arrival of the Spaniards among them at the time they actually came. This, however, we may account for without having recourſe to any thing the leaſt ſupernatural, or out of the ordinary courſe of things. The Weſt India iſlands had been diſcovered by Columbus, in 1492: he had made frequent voyages, and had even diſcovered the continent. Settlements had been made; the Spaniards had ſhown their proweſs and their cruelty; and we are not to doubt, that many of the iſlanders would quit their habitations to eſcape the fury of the invaders. It would naturally occur to theſe fugitives, that the arms of theſe new comers could not be reſiſted by thoſe of the weſtern nations, while their relentleſs cruelty might eaſily ſuggeſt that they would deſtroy all before them. From the year 1492, therefore, to 1508, there was time enough for this report to have reached Mexico: and we can only attribute it to the barbarous ſtate in which the Americans were, that the Spaniards were not perfectly known and deſcribed before their arrival.

75
Vaſt numbers of human ſacrifices.

But whatever were the omens by which the arrival of the Spaniards was announced, they appear to have had no effect in working any reformation upon Montezuma or his Mexicans. Inſtead of relaxing any thing from the barbarity of their religion, they ſeem to have augmented it. Wars were carried on every where, and priſoners ſacrificed by thouſands; inſomuch, that Montezuma finding the ſtone on which the priſoners were ſacrificed too ſmall, he cauſed one of monſtrous ſize to be put in its place. It was dragged along by an immenſe number of people: but in paſſing a wooden bridge over a canal, in the entry of the city, the bridge broke down by its enormous weight, and dragged ſeveral people into the water, among whom was the high prieſt, who had accompanied it on the road, ſcattering incenſe as he went along. This misfortune diſconcerted them conſiderably: nevertheleſs the ſtone, by dint of exceſſive labour, was got up again, and conſecrated by the murder of 12,200 priſoners. The time, however, was now at hand when this horrible and never-ceaſing butchery was to be ended, and a moſt ſevere vengeance to overtake the perpetrators. The Spaniards having eſtabliſhed themſelves pretty well in the iſland of Cuba and Hiſpaniola, now prepared to explore the continent alſo, with a view to extend the dominions of their ſovereign, and to ſatiate, if poſſible, their own appetites for wealth.

76
Conqueſt of Mexico undertaken by Cortes.

Mexico itſelf was firſt diſcovered, though imperfectly, by a Spaniard named *Nunez de Balboa*; but in 1518, the conqueſt of it was undertaken by a celebrated adventurer named *Ferdinando Cortes*. It was not, however, without great difficulty that he got his expedition ſet on foot; being perſecuted by the Spaniſh governors in the Weſt-Indies, ſo that he was at laſt obliged to throw off his allegiance to them, and proceed without any commiſſion. However, on the 10th of February, 1519, he ſet ſail from the Havannah in Cuba; and ſoon landed on the iſland of Cozomel, on the coaſt of Yucatan, diſcovered the preceding year. Here he joined one of his officers, named *Pedro d'Alvaredo*, who had arrived ſome days before, and collected ſome booty, and taken a few priſoners. But the general ſeverely cenſured his conduct; and the priſoners were diſmiſſed after they had been informed by an Indian interpreter named *Melchior*, that ſuch injuries were entirely diſagreeable to the intentions and wiſhes of Cortes. Here he muſtered his army, and found that it amounted to 508 ſoldiers, 16 horſemen, and 109 mechanics, pilots, and mariners. Having encouraged his men by a proper ſpeech, and releaſed, by means of ſome Indian ambaſſadors, a Spaniard named *Jerom de Aguilar*, who had been detained a priſoner for eight years, he proceeded to the river Tobaſco, where he hoped to be received in a friendly manner, as one *Grijalva* had been a ſhort time before; but from ſome unknown cauſe, he was violently attacked by them: however, the ſuperiority of the Spaniſh arms ſoon decided the victory, and the inhabitants were obliged to own the king of Caſtile as their ſovereign.

77 Receives an embaſſy from the emperor of Mexico.

The Spaniards then continued their courſe weſtward, to the harbour of St Juan de Ulloa; where they were met by two Mexican canoes, who carried two ambaſſadors from the emperor of that country, and ſhowed the greateſt ſigns of peace and amity. Their language was unknown to Aguilar; but one of the female priſoners abovementioned underſtood it, and tranſlated it into the Yucatan tongue; after which Aguilar interpreted the meaning in Spaniſh. This ſlave was afterwards named *Donna Marina*, and proved very uſeful in their conferences with the natives.

78 State of the empire at that time.

At this time the Mexican empire, according to Dr Robertſon, was arrived at a pitch of grandeur to which no ſociety had ever attained in ſo ſhort a period. Though it had ſubſiſted only for 130 years, its dominion extended from the north to the ſouth ſea; over territories ſtretching about 500 leagues from eaſt to weſt, and more than 200 from north to ſouth; comprehending provinces not inferior in fertility, population, and opulence, to any in the torrid zone.—Though by nature Montezuma poſſeſſed a good deal of courage and reſolution; yet from the firſt moment that the Spaniards appeared on his coaſt, he diſcovered ſymptoms of timidity and embarraſſment, and all his ſubjects were embarraſſed as well as himſelf. The general diſmay which took place on this occaſion was partly owing to the ſtrange figure the Spaniards made, and the prodigious power of their arms; but partly alſo to the following circumſtance. An opinion prevailed almoſt univerſally among the Americans, that ſome dreadful calamity impended over their heads, from a race of formidable invaders who ſhould come from regions towards the riſing ſun, to over-run and deſolate their country. The origin of this we have already attempted to explain; but as the Mexicans were more prone to ſuperſtition than any people in the new world, they were more deeply affected with the appearance of the Spaniards, whom they inſtantly ſuppoſed to be the inſtruments deſtined to bring about that fatal revolution which they dreaded; and this produced the embaſſy abovementioned.

By means of his two interpreters, Donna Marina and Aguilar, Cortes learned that the chiefs of the Mexican embaſſy were deputies from Pilpatoe and Teutile; the one governor of a province under the emperor, and the other the commander of all his forces in that province: the purport of their embaſſy was, to inquire what his intentions were in viſiting their coaſts, and to offer him what aſſiſtance he might need in order to continue his voyage. Cortes, in his turn, alſo profeſſed the greateſt friendſhip; and informed the ambaſſadors, that he came to propoſe matters of the utmoſt conſequence to the welfare of the prince and his kingdom; which he would more fully unfold in perſon to the governor and the general.

79 Cortes lands and fortifies his camp.

Next morning, without waiting for any anſwer, he landed his troops, his horſes, and his artillery; began to erect huts for his men, and to fortify his camp.—The natives, inſtead of oppoſing the entrance of theſe fatal gueſts into their country, aſſiſted them in all their operations with an alacrity which they had ere long reaſon to repent.

The next day the ambaſſadors had a formal audience; at which Cortes acquainted them, that he came from Don Carlos of Auſtria, king of Caſtile, the greateſt monarch of the eaſt, and was intruſted with propoſitions of ſuch moment, that he would impart them to none but the emperor himſelf, and therefore required to be conducted immediately to the capital.

80 The Indians endeavour to diſſuade him from going to the capital, but in vain.

This demand produced the greateſt uneaſineſs; and the ambaſſadors did all in their power to diſſuade Cortes from his deſign, endeavouring to conciliate his good-will by the preſents ſent him by Montezuma. Theſe they introduced with great parade, and conſiſted of fine cotton-cloth, of plumes of various colours, and of ornaments of gold and ſilver to a conſiderable value, the workmanſhip of which appeared to be as curious as the materials were rich. But theſe preſents ſerved only to excite the avidity of the Spaniards, and to encreaſe their deſire for becoming maſters of a country which abounded with ſo many precious commodities. Cortes indeed could ſcarcely reſtrain himſelf ſo far as to hear the arguments made uſe of by the ambaſſadors to diſſuade him from going to the capital; and, in a haughty, determined tone, inſiſted on his former demand of being admitted to a perſonal interview with their ſovereign.

During this converſation, ſome painters in the retinue of the Mexican chiefs had been diligently employed in delineating, upon white cotton clothes, figures of the ſhips, horſes, artillery, ſoldiers, and whatever elſe attracted their eyes as ſingular. When Cortes obſerved this, and was informed that theſe pictures were to be ſent to Montezuma, he reſolved to render the repreſentation ſtill more ſtriking and intereſting. The trumpets, by his orders, ſounded an alarm; the troops formed in order of battle, and ſhowed their agility and ſtrength in the beſt manner they could; while the artillery was pointed againſt the neighbouring trees, among which it made dreadful havock. The Indians for ſome time looked on with ſilent aſtoniſhment; but at the exploſion of the cannon, ſome fled, others fell to the ground, and all were ſo confounded, that Cortes found it difficult to quiet and compoſe their minds.

81 Montezuma made acquainted with his deſign.

When the painters had exerted their utmoſt efforts in repreſenting all theſe wonderful things, meſſengers were immediately diſpatched to Montezuma with the pictures, and a full account of every thing that had paſſed ſince the arrival of the Spaniards, together with ſome European curioſities to Montezuma; which, though of no great value, Cortes believed would be acceptable on account of their novelty. The Mexican monarchs, in order to obtain the earlieſt information of every occurrence in all parts of their empire, had couriers poſted at proper ſtations along the principal roads; and as theſe were trained to agility by a regular education, they conveyed intelligence with ſurpriſing rapidity. Though the city in which Montezuma reſided was above 180 miles from St Juan de Ulloa, Cortes's preſents were carried thither, and an anſwer returned to his demands, in a few days. As the anſwer was unfavourable, Montezuma had endeavoured to mollify the Spaniſh general by the richneſs of his preſents. Theſe conſiſted of the manufactures of the country; cotton-ſtuffs ſo fine, and of ſuch

82 Sends an unfavourable anſwer, but accompanied with rich preſents.

delicate texture, as to reſemble ſilk; pictures of animals, trees, and other natural objects, formed with feathers of different colours, diſpoſed and mingled with ſuch ſkill and elegance as to rival the works of the pencil in truth and beauty of imitation. But what chiefly attracted their attention, were too large plates of a circular form; one of maſſive gold repreſenting the ſun, the other of ſilver repreſenting the moon. Theſe were accompanied with bracelets, collars, rings, and other trinkets of gold; and that nothing might be wanting which could give the Spaniards a complete idea of what the country afforded, ſome boxes filled with pearls, precious ſtones, and grains of gold unwrought, as they had been found in the mines or rivers, were ſent along with the reſt. Cortes received all with an appearance of the moſt profound reſpect for Montezuma; but when the Mexicans, preſuming upon this, informed him, that their maſter, though he deſired him to accept of what he had ſent as a token of his regard for the prince whom he repreſented, would not give his conſent that foreign troops ſhould approach nearer to his capital, or even allow them to continue longer in his dominions, Cortes declared, in a manner more reſolute and peremptory than formerly, that he muſt inſiſt on his firſt demand; as he could not, without diſhonour, return to his own ſovereign until he was admitted into the preſence of the prince whom he was appointed to viſit in his name. The Mexicans were aſtoniſhed at the ſight of a man who dared to oppoſe the will of their emperor; but not being willing to come to an open rupture with ſuch formidable enemies, with much ado they prevailed upon Cortes to promiſe that he would not move from his preſent camp until the return of a meſſenger whom they ſent to Montezuma for further inſtructions.

83 Cortes ſtill inſiſts on his demands.

The puſillanimity of the Indian monarch afforded time to the Spaniards to take meaſures which would have been out of their power had they been vigorouſly attacked on their firſt refuſal to obey his orders. Cortes uſed every method of ſecuring the affections of the ſoldiers; which indeed was very neceſſary, as many of them began to exclaim againſt the raſhneſs of his attempt in leading them againſt the whole force of the Mexican empire. In a ſhort time Teutile arrived with another preſent from Montezuma, and together with it delivered the ultimate orders of that monarch to depart inſtantly out of his dominions; and when Cortes, inſtead of complying with his demands, renewed his requeſt of audience, the Mexican immediately left the camp with ſtrong marks of ſurpriſe and reſentment. Next morning, none of the natives appeared; all friendly correſpondence ſeemed to be at an end, and hoſtilities were expected to commence every moment. A ſudden conſternation enſued among the Spaniards, and a party was formed againſt him by the adherents of Velaſques; who took advantage of the occaſion, and deputed one of their number, a principal officer, to remonſtrate, as if in name of the whole army, againſt his raſhneſs, and to urge the neceſſity of his returning to Cuba. Cortes received the meſſage without any appearance of emotion; and as he well knew the temper and wiſhes of his ſoldiery, and foreſaw how they would receive a propoſition ſo fatal to all the ſplendid hopes and ſchemes which they had been forming with ſuch complacency, he pretended to comply with the requeſt now made him, and iſſued orders that the army ſhould be in readineſs next day to embark for Cuba. Upon hearing this, the troops, as Cortes had expected, were quite outrageous: they poſitively refuſed to comply with theſe orders, and threatened immediately to chooſe another general if Cortes continued to inſiſt on their departure.

84 Montezuma peremptorily commands him to leave his dominions.

Our adventurer was highly pleaſed with the diſpoſition which now appeared among his troops: nevertheleſs, diſſembling his ſentiments, he declared, that his orders for embarking had proceeded from a perſuaſion that it was agreeable to his fellow-ſoldiers, to whoſe opinion he had ſacrificed his own; but now he acknowledged his error, and was ready to reſume his original plan of operarion. This ſpeech was highly applauded; and Cortes, without allowing his men time to cool, ſet about carrying his deſigns into execution. In order to give a beginning to a colony, he aſſembled the principal perſons in his army, and by their ſuffrages elected a council and magiſtrates, in whom the government was to be veſted. The perſons choſen were moſt firmly attached to Cortes; and the new ſettlement had the name of *Villa Rica de la Vera Cruz*; that is, the rich town of the true croſs.

85 Villa Rica founded.

Before this court of his own making, Cortes did not heſitate at reſigning all his authority, and was immediately re-elected chief-juſtice of the colony, and captain-general of his army, with an ample commiſſion, in the king's name, to continue in force till the royal pleaſure ſhould be farther known. The ſoldiers eagerly ratified their choice by loud acclamations; and Cortes, now conſidering himſelf as no longer accountable to any ſubject, began to aſſume a much greater degree of dignity, and to exerciſe more extenſive powers than he had done before. Some of the ſoldiers began to exclaim againſt the proceedings of the council as illegal; but the ringleaders were inſtantly ſent on board the fleet loaded with irons. By this timely ſeverity the reſt were overawed; and Cortes, knowing of how great importance unanimity was to his future ſucceſs, ſoon found means to reconcile thoſe who were moſt diſaffected: to which purpoſe a liberal diſtribution of the Mexican gold, both among friends and foes, contributed not a little.

86 The government of the new colony veſted in Cortes.

87 Makes an alliance with the cacique of Zempoalla.

Cortes having thus ſtrengthened himſelf as well as he could, reſolved to advance into the country; and to this he was encouraged by the behaviour of the cacique or petty prince of Zempoalla, a conſiderable town at no great diſtance. This prince, though ſubject to Montezuma, was exceedingly impatient of the yoke; and ſo filled with dread and hatred of the emperor, that nothing could be more acceptable to him than an appearance of being delivered from that ſubjection; and a deliverance of this kind he now hoped from the Spaniards. For this reaſon, he ſent ambaſſadors to Cortes, with offers of friendſhip, which were gladly accepted by him; and in conſequence of the alliance, he very ſoon viſited Zempoalla. Here he was received in the moſt friendly manner imaginable, and had a reſpect paid towards him almoſt equivalent to adoration. The cacique informed him of many particulars relating to the character of Montezuma.—He told him that he was a tyrant, haughty, cruel, and

88 Character of Montezuma given by the cacique.

and ſuſpicious; who treated his own ſubjects with arrogance, ruined the conquered provinces by his extortions, and often tore their ſons and daughters from them by violence; the former to be offered as victims to his gods, the latter to be reſerved as concubines for himſelf and favourites. Cortes, in reply, artfully inſinuated, that one great object of the Spaniards in viſiting a country ſo remote from their own was, to redreſs grievances, and to relieve the oppreſſed; and having encouraged him to hope for this interpoſition in due time, continued his march to Quiabiſlan, the territory of another cacique, and where, by the friendly aid of the Indians, a Spaniſh colony was ſoon formed.

During the reſidence of Cortes in theſe parts, he ſo far wrought on the minds of the caciques of Zempoalla and Quiabiſlan, that they ventured to inſult the Mexican power, at the very name of which they had been formerly accuſtomed to tremble. Some of Montezuma's officers having appeared to levy the uſual tribute, and to demand a certain number of human victims, as an expiation of their guilt in preſuming to hold intercourſe with thoſe ſtrangers whom the emperor had commanded to leave his dominions; inſtead of obeying his orders, they made them priſoners, treated them with great indignity, and, as their ſuperſtition was no leſs barbarous than Montezuma's, they threatened to ſacrifice them to their gods. From this laſt danger, however, they were delivered by the interpoſition of Cortes, who manifeſted the utmoſt horror at the mention of ſuch a deed. This act of rebellion firmly attached the two caciques to the intereſt of Cortes; and without heſitation they acknowledged themſelves vaſſals of the king of Spain. Their example was followed by the Totonaques, a fierce people who inhabited the mountainous parts of the country. They willingly ſubjected themſelves to the crown of Caſtile; and offered to accompany Cortes with all their forces in his march towards Mexico.

89
The caciques of Zempoalla, Quiabiſlan and ſome others, ſubmit.

Though Cortes had now taken ſuch meaſures as in a manner enſured his ſucceſs; yet as he had thrown off all dependence on the governor of Cuba, who was his lawful ſuperior, and apprehended his intereſt at court, he thought proper, before he ſet out on his intended expedition, to take the moſt effectual meaſures againſt the impending danger. With this view, he perſuaded the magiſtrates of his colony to addreſs a letter to the king, containing a pompous account of their own ſervices, of the country they had diſcovered, &c. and of the motives which had induced them to throw off their allegiance to the governor of Cuba, and to ſettle a colony dependent on the crown alone, in which the ſupreme power civil as well as military had been veſted in Cortes: humbly requeſting their ſovereign to ratify what had been done by his royal authority. Cortes himſelf wrote in a ſimilar ſtrain; but as he knew that the Spaniſh court, accuſtomed to the repeated exaggerations of American adventurers, would give little credit to the ſplendid accounts of New-Spain, if they were not accompanied with ſuch a ſpecimen of what it contained as would excite an high idea of its opulence, he ſolicited his ſoldiers to relinquiſh what they might claim as their part of the treaſures which had hitherto been collected, in order that the whole might be ſent to the king. Portocarrero and Montejo, the chief magiſtrates of the colony, were appointed to carry this preſent to Caſtile, with expreſs orders not to touch at Cuba in their paſſage thither. But while a veſſel was preparing for their departure, an unexpected event produced a general alarm. Some ſoldiers and ſailors, ſecretly diſaffected to Cortes, formed a deſign of ſeizing one of the brigantines, and making their eſcape to Cuba, in order to give ſuch intelligence to the governor as might enable him to intercept the veſſel which was to carry the treaſure and the diſpatches to Spain. This conſpiracy was conducted with profound ſecrecy; but at the moment when every thing was ready for execution, the ſecret was diſcovered by one of the aſſociates. The latent ſpirit of diſaffection which Cortes was now too well convinced had not been extinguiſhed amongſt his troops, gave him very great uneaſineſs. The only method which he could think of to prevent ſuch conſpiracies for the future was, to deſtroy his fleet; and thus deprive his ſoldiers of every reſource except that of conqueſt: and with this propoſal he perſuaded his men to comply. With univerſal conſent therefore the ſhips were drawn aſhore, and, after being ſtripped of their ſails, rigging, iron-work, and whatever elſe might be of uſe, they were broke in pieces.

90
The Magiſtrates of Villa Rica ſend a letter to the king of Spain in favour of Cortes.

91
Cortes burns his fleet,

Cortes having thus rendered it neceſſary for his troops to follow wherever he choſe to lead, began his march to Zempoalla with 500 infantry, 15 horſe, and ſix field-pieces. The reſt of his troops, conſiſting chiefly of ſuch as from age or infirmity were leſs fit for active ſervice, he left as a garriſon in Villa Rica, under the command of Eſcalante, an officer of merit, and warmly attached to his intereſt. The cacique of Zempoalla ſupplied him with proviſions; and with 200 of thoſe Indians called *Tamames*, whoſe office, in a country where tame animals were unknown, was to carry burdens and perform all manner of ſervile labour. He offered likewiſe a conſiderable body of troops; but Cortes was ſatisfied with 400; taking care, however, to chooſe perſons of ſuch note, that they might ſerve as hoſtages for the fidelity of their maſter.

Nothing memorable happened till the Spaniards arrived on the confines of the republic of Tlaſcala. The inhabitants of that province were warlike, fierce, and revengeful, and had made conſiderable progreſs in agriculture and ſome other arts. They were implacable enemies to Montezuma; and therefore Cortes hoped that it would be an eaſy matter for him to procure their friendſhip. With this view, four Zempoallans of high rank were ſent ambaſſadors to Tlaſcala, dreſſed with all the badges of that office uſual among the Indians. The ſenate were divided in their opinions with regard to the propoſals of Cortes: but at laſt Magiſcatzin, one of the oldeſt ſenators, and a perſon of great authority, mentioned the tradition of their anceſtors, and the revelations of their prieſts; that a race of invincible men, of divine origin, who had power over the elements, ſhould come from the eaſt to ſubdue their country. He compared the reſemblance which the ſtrangers bore to the perſons figured in the tradition of Mexico, their dominion over the elements of fire, air, and water; he reminded the

92
Sends ambaſſadors to the republic of Tlaſcala.

the ſenate of their prodigies, omens, and ſignals, which had lately terrified the Mexicans, and indicated ſome very important event; and then declared his opinion, that it would be raſhneſs to oppoſe a force apparently aſſiſted by heaven, and men who had already proved, to the ſad experience of thoſe who oppoſed them, that they were invincible. This orator was oppoſed by Xicotencal, who endeavoured to prove that the Spaniards were at beſt but powerful magicians: that they had rendered themſelves obnoxious to the gods by pulling down their images and altars, (which indeed Cortes had very imprudently done at Zempoalla); and of conſequence, that they might eaſily be overcome, as the gods would not fail to reſent ſuch an outrage. He therefore voted for war, and adviſed the cruſhing of theſe invaders at one blow.

93 The Tlaſcalans reſolve on war.

The advice of Xicotencal prevailed; and in conſequence of it, the ambaſſadors were detained; which giving Cortes the alarm, he drew nearer the city of Tlaſcala. In this tranſaction we may eaſily ſee how little the Tlaſcalans, notwithſtanding all their ferocity, were ſkilled in military affairs. They ſuffered Cortes, with his army drawn up in good order, to paſs a ſtrong wall between two mountains, which might have been very advantageouſly defended againſt him. He had not advanced far beyond this paſs, however, before a party of Tlaſcalans with plumes were diſcovered, which denoted that an army was in the field. Theſe he drove before him by a detachment of ſix horſe, obliged them to join another party, and then reinforcing the advanced detachment, charged the enemy with ſuch vigour that they began to retire. Five thouſand Tlaſcalans, whom Xicotencal had placed in ambuſh, then ruſhed out of their hiding places, juſt as the infantry came up to aſſiſt their ſlender body of cavalry. The enemy attacked with the utmoſt fury; but were ſo much diſconcerted by the firſt diſcharge of the fire-arms, that they retreated in confuſion, furniſhing the Spaniards with an opportunity of purſuing them with great ſlaughter. Cortes, however, ſuppoſing that this could not be their whole force, advanced with the utmoſt caution, in order of battle, to an eminence, from whence he had a view of the main body of the Tlaſcalan army commanded by Xicotencal, conſiſting of no fewer than 40,000 men. By theſe the ſmall army of Cortes was entirely ſurrounded; which Xicotencal no ſooner perceived, than he contracted the circle with incredible diligence, while the Spaniards were almoſt overwhelmed with ſhowers of arrows, darts, and ſtones. It is impoſſible but in this caſe many of the Spaniards muſt have periſhed, had it not been for the inſufficiency of the Indian weapons. Their arrows and ſpears were headed only with flint, or the bones of fiſhes; their ſtakes hardened in the fire, and wooden ſwords, though deſtructive weapons among naked Indians, were eaſily turned aſide by the Spaniſh bucklers, and could hardly penetrate the quilted jackets which the ſoldiers wore. Theſe circumſtances gave the Spaniards a prodigious advantage over them: and therefore the Tlaſcalans, notwithſtanding their valour and ſuperiority in number, could accompliſh no more in the preſent inſtance, than to kill one horſe and ſlightly wound nine ſoldiers.

95 But are defeated, and ſue for peace.

95 Which is granted.

The Tlaſcalans being taught by this, and ſome ſubſequent encounters, how much they were inferior to the Spaniards, began to conceive them to be really what Magiſcatzin had ſaid: a ſuperior order of beings, againſt whom human power could not prevail. In this extremity they had recourſe to their prieſts, requiring them to reveal the cauſes of ſuch extraordinary events, and to declare what means they ſhould take to repel ſuch formidable invaders. The prieſts, after many ſacrifices and incantations, delivered their reſponſe, That theſe ſtrangers were the offspring of the ſun, procreated by his animating energy in the regions of the eaſt; that, by day, while cheriſhed with the influence of his parental beams, they were invincible; but by night, when his reviving heat was withdrawn, their vigour declined and faded like herbs in the field, and they dwindled down into mortal men. In conſequence of this, the Tlaſcalans acted in contradiction to one of their moſt eſtabliſhed maxims in war, and ventured to attack the enemy in the night-time, hoping to deſtroy them when infeebled and ſurpriſed. But the Spaniſh centinels having obſerved ſome extraordinary movements among the Tlaſcalans, gave the alarm. Immediately the troops were under arms, and ſallying out, defeated their antagoniſts with great ſlaughter, without allowing them to approach the camp. By this diſaſter the Tlaſcalans were heartily diſpoſed to peace; but they were at a loſs to form an adequate idea of the enemies they had to deal with. They could not aſcertain the nature of theſe ſurpriſing beings, or whether they were really of a benevolent or malignant diſpoſition. There were circumſtances in their behaviour which ſeemed to favour each opinion. On the one hand, as the Spaniards conſtantly diſmiſſed the priſoners whom they took, not only without injury, but often with preſents of European toys, and renewed their offers of peace after every victory; this lenity amazed people accuſtomed to the exterminating ſyſtem of war known in America, and who ſacrificed and devoured without mercy all the captives taken in battle; and diſpoſed them to entertain ſentiments favourable to their humanity. But, on the other hand, as Cortes had ſeized 50 of their countrymen who brought proviſions to their camp, and cut of their heads; this bloody ſpectacle, added to the terror occaſioned by the fire-arms and horſes, filled them with dreadful ideas of their ferocity. Accordingly they addreſſed them in the following manner: "If (ſaid they) you are divinities of a cruel and ſavage nature, we preſent to you five ſlaves, that you may drink their blood and eat their fleſh. If you are mild deities, accept an offering of incenſe and variegated plumes. If you are men, here is meat, bread, and fruit, to nouriſh you." After this addreſs, the peace was ſoon concluded, to the great ſatsfaction of both parties. The Tlaſcalans yielded themſelves as vaſſals to the crown of Caſtile, and engaged to aſſiſt Cortes in all his operations; while he took the republic under his protection, and promiſed to defend their perſons and poſſeſſions from injury and violence.

96 Great diſtreſſes of the Spaniards.

This reconciliation took place at a very ſeaſonable juncture for the Spaniards. They were not only worn out with inceſſant toil, but ſo deſtitute of neceſſaries, that they had no other ſalve to dreſs their wounds but what was compoſed of the fat of Indians whom they had ſlain. Their diſtreſſes, in ſhort, were ariſen to ſuch an height, that they had began to murmur, and even to deſpair, inſomuch that Cortes had much difficulty in reſtraining them within any kind of bounds; but the ſubmiſſion of the Tlaſcalans, and their own triumphant entry into the city, where they were received with the reverence due to a ſuperior order of beings, baniſhed at once all memory of paſt ſufferings, diſpelled every anxious thought, and fully convinced them that they could not be reſiſted by any power in America.

Cortes left no method untried to gain the favour and confidence of the Tlaſcalans; which, however, he had almoſt entirely loſt, by his untimely zeal in deſtroying their idols, as he had done thoſe of Zempoalla. But he was deterred from this raſh action by his chaplain, father Bartholomew de Olmedo; and left the Tlaſcalans in the undiſturbed exerciſe of their ſuperſtition, requiring only that they ſhould deſiſt from their horrid practice of offering human victims. As ſoon as his troops were fit for ſervice, he reſolved to continue his march towards Mexico, notwithſtanding the remonſtrances of the Tlaſcalans, who looked upon his deſtruction as unavoidable if he put himſelf into the power of ſuch a faithleſs prince as Montezuma. But the emperor, probably intimidated with the fame of his exploits, had reſolved to admit his viſit; and informed Cortes, that he had given orders for his friendly reception at Cholula, the next place of any conſequence on the road to Mexico. In this, however, he was, by no means ſincere. Cholula was looked upon by all the inhabitants of the empire as a very holy place; the ſanctuary and chief ſeat of their gods, to which pilgrims reſorted from every province, and a greater number of human victims were offered in its principal temple, than even in that of Mexico. Montezuma therefore, invited the Spaniards thither, either from ſome ſuperſtitious hopes that the gods would not ſuffer this ſacred manſion to be defiled; or from a belief, that he himſelf might there find an opportunity of cutting them off with more certainty of ſucceſs, when under the immediate protection of his gods. Cortes, however, was received with much ſeeming cordiality; but 6000 Tlaſcalan troops, who accompanied him, were obliged to remain without the town, as the Cholulans refuſed to admit their ancient enemies within their precincts. Yet two of theſe by diſguiſing themſelves, got into the city, and acquainted Cortes, that they obſerved the women and children belonging to the principal citizens, retiring every night in a great hurry, and that ſix children had been ſacrificed in the great temple; a ſign that ſome warlike enterpriſe was at hand. At the ſame time Donna Marina, the interpreter, received information from an Indian woman of diſtinction, whoſe confidence ſhe had gained, that the deſtruction of the Spaniards was concerted; that a body of Mexican troops lay concealed near the town; that ſome of the ſtreets were barricaded, in others deep pits or trenches were dug, and ſlightly covered over, as traps into which the horſe might fall; that ſtones and miſſive weapons were collected on the tops of the temples, with which to overwhelm the infantry; that the fatal hour was already at hand, and their ruin unavoidable. Cortes, alarmed at this news, ſecretly arreſted three of the chief prieſts, from whom he extorted a confeſſion that confirmed the intelligence he had already received. As not a moment was to be loſt, he inſtantly reſolved to prevent his enemies, and to inflict on them ſuch dreadful vengeance as might ſtrike Montezuma and his ſubjects with terror. For this purpoſe the Spaniards and Zempoallans were drawn up in a large court, which had been allotted for their quarters, near the centre of the town; the Tlaſcalans had orders to advance; the magiſtrates and chief citizens were ſent for under various pretexts, and ſeized. On a ſignal given, the troops ruſhed out, and fell upon the multitude, deſtitute of leaders, and ſo much aſtoniſhed, that the weapons dropped from their hands, and they ſtood motionleſs, and incapable of defence. While the Spaniards attacked them in front, the Tlaſcalans did the ſame in the rear; the ſtreets were filled with ſlaughter; the temples, which afforded a retreat to the prieſts, and ſome leading men, were ſet on fire, and they periſhed in the flames. This ſcene of horror continued two days, during which the wretched inhabitants ſuffered all that the deſtructive rage of the Spaniards, or the implacable revenge of their Indian allies, could inflict. At length the carnage ceaſed, after the ſlaughter of 6000 Cholulans, without the loſs of a ſingle Spaniard.—Cortes then releaſed the magiſtrates; and reproaching them bitterly for their intended treachery, declared, that as juſtice was now appeaſed, he forgave the offence; but required them to recal the inhabitants who had fled, and re-eſtabliſh order in the town. Such was the aſcendant that the Spaniards had now obtained over this ſuperſtitious race, that this order was inſtantly complied with; and the city was in a few days again filled with people, who paid the moſt reſpectful ſervice to thoſe men whoſe hands were ſtained with the blood of their relations and fellow-citizens.

97 Cortes continues his march for Mexico.

98 Treachery of Montezuma and the Cholulans.

99 Severe puniſhment of the Cholulans.

From Cholula, Cortes advanced directly towards Mexico; and throughout the whole of his journey, was entertained with accounts of the oppreſſions and cruelty of Montezuma. This gave him the greateſt hope of accompliſhing his deſign; as he now perceived that the empire was entirely divided, and no ſort of unanimity prevailed among them. No enemy appeared to check his progreſs. Montezuma was quite irreſolute; and Cortes was almoſt at the gates of the capital before the emperor had determined whether to receive him as a friend, or oppoſe him as an enemy. But as no ſign of open hoſtility appeared, the Spaniards, without regarding the fluctuations of Montezuma's ſentiments, continued their march to Mexico, with great circumſpection and the ſtricteſt diſcipline, though without ſeeming to ſuſpect the prince whom they were about to viſit.

100 Diſaffection of Montezuma's ſubjects.

When they drew near the city, about 1000 perſons, who appeared to be of diſtinction, came forth to meet them, adorned with plumes, and clad in mantles of fine cotton. Each of theſe, in his order, paſſed by Cortes, and ſaluted him according to the mode deemed moſt reſpectful and ſubmiſſive in their country. They announced the approach of Montezuma himſelf, and ſoon after his harbingers came in ſight. There appeared firſt 200 perſons in an uniform dreſs, with large plumes of feathers, alike in faſhion, marching two and two, in deep ſilence, barefooted, with their eyes fixed on the ground. Theſe were followed by a company of higher rank,

101 Meeting of Cortes and Montezuma.

rank, in their moſt ſhowy apparel; in the midſt of whom was Montezuma, in a chair or litter richly ornamented with gold, and feathers of various colours. Four of his principal favourites carried him on their ſhoulders, others ſupported a canopy of curious workmanſhip over his head. Before him marched three officers, with rods of gold in their hands, which they lifted up on high at certain intervals; and at that ſignal all the people bowed their heads, and hid their faces, as unworthy to look on ſo great a monarch — When he drew near, Cortes diſmounted, advancing towards him with officious haſte, and in a reſpectul poſture. At the ſame time Montezuma alighted from his chair, and leaning on the arms of two of his near relations, approached with a ſlow and ſtately pace, his attendants covering the ſtreet with cotton cloths, that he might not touch the ground. Cortes accoſted him with profound reverence, after the European faſhion. He returned the ſalutation, according to the mode of his country, by touching the earth with his hand, and then kiſſing it. This ceremony, the cuſtomary expreſſion of reverence from inferiors towards thoſe who are above them in rank, appeared ſuch amazing condeſcenſion in a proud monarch, who ſcarcely deigned to conſider the reſt of mankind as of the ſame ſpecies with himſelf, that all his ſubjects firmly believed thoſe perſons, before whom he humbled himſelf in this manner, to be ſomething more than human. Accordingly, as they marched through the croud, the Spaniards frequently, and with much ſatisfaction, heard themſelves denominated *teules*, or *divinities*. Nothing material paſſed in this firſt interview. Montezuma conducted Cortes to the quarters which he had prepared for his reception; and immediately took leave of him, with a politeneſs not unworthy of a court more refined. "You are now (ſays he), with your brothers, in your own houſe; refreſh yourſelves after your fatigue, and be happy until I return." The place allotted to the Spaniards for their lodging, was a houſe built by the father of Montezuma. It was ſurrounded by a ſtone wall, with towers at proper diſtances, which ſerved for defence as well as for ornament; and its apartments and courts were ſo large as to accommodate both the Spaniards and their Indian allies. The firſt care of Cortes was to take precautions for his ſecurity, by planting the artillery ſo as to command the different avenues which led to it, by appointing a large diviſion of his troops to be always on guard, and by poſting ſentinels at proper ſtations, with injunctions to obſerve the ſame vigilant diſcipline as if they were within ſight of an enemy's camp.

In the evening, Montezuma returned to viſit his gueſts, with the ſame pomp as in their firſt interview; and brought preſents of ſuch value, not only to Cortes and to his officers, but even to the private men, as proved the liberality of the monarch to be ſuitable to the opulence of his kingdom. A long conference enſued, in which Cortes learned what was the opinion of Montezuma with reſpect to the Spaniards. It was an eſtabliſhed tradition, he told him, among the Mexicans, that their anceſtors came originally from a remote region, and conquered the provinces now ſubject to his dominion: that after they were ſettled there, the great captain who conducted this colony, returned to his own country, promiſing, that at ſome future period his deſcendants ſhould viſit them, aſſume the government, and reform their conſtitutions and laws; that, from what he had heard and ſeen of Cortes and his followers, he was convinced that they were the very perſons whoſe appearance and prophecies taught them to expect; that accordingly, he had received them, not as ſtrangers, but as relations of the ſame blood and parentage, and deſired that they might conſider themſelves as maſters in his dominions; for both himſelf and his ſubjects ſhould be ready to comply with their will and even to prevent their wiſhes. Cortes made a reply in his uſual ſtyle with reſpect to the dignity and power of his ſovereign, and his intention in ſending him into that country; artfully endeavouring ſo to frame his diſcourſe, that it might coincide as much as poſſible with the idea which Montezuma had formed concerning the origin of the Spaniards. Next morning, Cortes, and ſome of his principal attendants, were admitted to a public audience of the emperor. The three ſubſequent days were employed in viewing the city; the appearance of which, ſo far ſuperior in the order of its buildings and the number of its inhabitants to any place the Spaniards had beheld in America, and yet ſo little reſembling the ſtructure of an European city, filled them with ſurprize and admiration.

102
Deſcription of the city of Mexico.

Mexico, *Tenuchtitlan*, as it was anciently called by the natives, is ſituated in a large plain, environed by mountains of ſuch height, that, though within the torrid zone, the temperature of its climate is mild and healthful. All the moiſture which deſcends from the high grounds, is collected in ſeveral lakes, the two largeſt of which, of about 90 miles in circuit, communicate with each other. The waters of the one are freſh, thoſe of the others are brackiſh. On the banks of the latter, and on ſome ſmall iſlands adjoining to them, the capital of Montezuma's empire was built.— The acceſs to the city was by artificial cauſeways or ſtreets, formed of ſtones and earth, about 30 feet in breadth. As the waters of the lake, during the rainy ſeaſon, overflowed the flat country, theſe cauſeways were of conſiderable length. That of Tacuba, on the weſt a mile and a half; that of Tezeuco, on the north-weſt three miles; that of Cuoyacan, towards the ſouth ſix miles. On the eaſt there was no cauſeway, and the city could be approached only by canoes. In each of theſe cauſeways were openings, at proper intervals, through which the waters flowed; and over theſe beams of timber were laid, which being covered with earth, the cauſeway or ſtreet had every where an uniform appearance. As the approaches to the city were ſingular, its conſtruction was remarkable. Not only the temple of their gods, but the houſes belonging to the monarch, and to perſons of diſtinction, were of ſuch dimenſions, that, in compariſon with any other buildings which had been diſcovered in America, they might be termed *magnificent*. The habitations of the common people were mean, reſembling the huts of other Indians. But they were all placed in a regular manner, on the banks of the canals which paſſed thro' the city, in ſome of its diſtricts, or on the ſides of the ſtreets which interſected it in other quarters. In ſeveral places were large openings or ſquares, one of which allotted for the great market, is ſaid to have been ſo ſpacious, that 40,000 or 50,000 perſons carried on traffic there. In this city, the pride of the New World, and the nobleſt monument of the induſtry and art of man, while unacquainted with the uſe of iron, and deſtitute of aid from any domeſtic animal, the Spaniards, who are moſt moderate in their computations, reckon that there were at leaſt 60,000 inhabitants.

103 Uneaſineſs of the Spaniards.

But how much ſoever the novelty of thoſe objects might amuſe or aſtoniſh the Spaniards, they felt the utmoſt ſolicitude with reſpect to their own ſituation.—From a concurrence of circumſtances, no leſs unexpected than favourable to their progreſs, they had been allowed to penetrate into the heart of a powerful kingdom, and were now lodged in its capital, without having once met with open oppoſition from its monarch. The Tlaſcalans, however, had earneſtly diſſuaded them from placing ſuch confidence in Montezuma as to enter a city of ſuch a peculiar ſituation as Mexico, where that prince would have them at mercy, ſhut up as it were in a ſnare, from which it was impoſſible to eſcape. They aſſured them that the Mexican prieſts had, in the name of the gods, counſelled their ſovereign to admit the ſtrangers into the capital, that he might cut them off there at one blow with perfect ſecurity. The Spaniards now perceived, too plainly, that the apprehenſions of their allies was not deſtitute of foundation; that, by breaking the bridges placed at certain intervals on the cauſeways, or by deſtroying part of the cauſeways themſelves, their retreat would be rendered impracticable, and they muſt remain cooped up in the centre of a hoſtile city, ſurrounded by multitudes ſufficient to overwhelm them, and without a poſſibility of receiving aid from their allies. Montezuma had, indeed, received them with diſtinguiſhed reſpect. But ought they to reckon upon this as real, or to conſider it as feigned? Even if it were ſincere, could they promiſe on its continuance? Their ſafety depended upon the will of a monarch in whoſe attachment they had no reaſon to confide; and an order flowing from his caprice, or a word uttered by him in paſſion, might decide irrevocably concerning their fate.

104 Some hoſtilities between the Spaniards and Mexicans.

Theſe reflections, ſo obvious as to occur to the meaneſt ſoldier, did not eſcape the vigilant ſagacity of their general. Before he ſet out from Cholula, Cortes had received advice from Villa Rica, that Qualpopoca, one of the Mexican generals on the frontiers, having aſſembled an army in order to attack ſome of the people whom the Spaniards had encouraged to throw off the Mexican yoke, Eſcalante had marched out with part of the garriſon to ſupport his allies: that an engagement had enſued, in which, though the Spaniards were victorious, Eſcalante, with ſeven of his men, had been mortally wounded, his horſe killed, and one Spaniard had been ſurrounded by the enemy, and taken alive; that the head of this unfortunate captive, after being carried in triumph to different cities, in order to convince the people, that their invaders were not immortal, had been ſent to Mexico. Cortes, though alarmed with this intelligence, as an indication of Montezuma's hoſtile intentions, had continued his march. But as ſoon as he entered Mexico, he became ſenſible, that, from an exceſs of confidence in the ſuperior valour and diſcipline of his troops, as well as from the diſadvantage of having nothing to guide him in an unknown country, but the defective intelligence which he received from people with whom his mode of communication was very imperfect, he had puſhed forward into a ſituation, where it was difficult to continue, and from which it was dangerous to retire. Diſgrace, and perhaps ruin, was the certain conſequence of attempting the latter. The ſucceſs of his enterpriſe depended upon ſupporting the high opinion which the people of New-Spain had formed with reſpect to the irreſiſtible power of his arms. Upon the firſt ſymptom of timidity on his part, their veneration would ceaſe, and Montezuma, whom fear alone reſtrained at preſent, would let looſe upon him the whole force of his empire. At the ſame time, he knew that the countenance of his own ſovereign was to be obtained only by a ſeries of victories; and that nothing but the merit of extraordinary ſucceſs could ſcreen his conduct from the cenſure of irregularity. From all theſe conſiderations, it was neceſſary to maintain his ſtation, and to extricate himſelf out of the difficulties in which one bold ſtep had involved him, by venturing upon another ſtill bolder.—The ſituation was trying, but his mind was equal to it; and after revolving the matter with deep attention, he fixed upon a plan no leſs extraordinary than daring.—He determined to ſeize Montezuma in his palace, and carry him a priſoner to the Spaniſh quarters. From the ſuperſtitious veneration of the Mexicans for the perſon of their monarch, as well as their implicit ſubmiſſion to his will, he hoped, by having Montezuma in his power, to acquire the ſupreme direction of their affairs; or at leaſt, with ſuch a ſacred pledge in his hands, he made no doubt of being ſecure from any effort of their violence.

105 Cortes reſolves to ſeize Montezuma in his palace

This he immediately propoſed to his officers. The timid ſtartled at a meaſure ſo audacious, and raiſed objections. The more intelligent and reſolute, conſcious that it was the only reſource in which there appeared any proſpect of ſafety, warmly approved of it, and brought over their companions ſo cordially to the ſame opinion, that it was agreed inſtantly to make the attempt. At his uſual hour of viſiting Montezuma, Cortes went to the palace, accompanied by Alvarado, Sandoval, Lugo, Velaſquez de Leon, and Davila, five of his principal officers, and as many truſty ſoldiers. Thirty choſen men followed, not in regular order, but ſauntering at ſome diſtance, as if they had no object but curioſity; ſmall parties were poſted at proper intervals, in all the ſtreets leading from the Spaniſh quarters to the court; and the remainder of his troops, with the Tlaſcalan allies, were under arms, ready to ſally out on the firſt alarm. Cortes and his attendants were admitted without ſuſpicion; the Mexicans retiring, as uſual, out of reſpect. He addreſſed the monarch in a tone very different from that which he had employed in former conferences; reproaching him bitterly as the author of the violent aſſault made upon the Spaniards by one of his officers, and demanding public reparation for the loſs which he had ſuſtained by the death of ſome of his companions, as well as for the inſult offered to the great prince whoſe ſervants they were. Montezuma, confounded at this unexpected accuſation, and changing colour, either from the conſciouſneſs of guilt, or from feeling the indignity with which he was treated, aſſerted his own innocence with great earneſtneſs; and as a proof of it, gave orders inſtantly to bring Qualpopoca and his accomplices priſoner to Mexico. Cortes replied, with ſeeming complaiſance, that a declaration ſo reſpectable left no doubt remaining in his own mind, but that ſomething more was requiſite to ſatisfy his followers, who would never be convinced that Montezuma did not harbour hoſtile intentions againſt them, unleſs, as an evidence of his confidence and attachment, he removed from his own palace, and took up his reſidence in the Spaniſh quarters, where he ſhould be ſerved and honoured as became a great monarch. The firſt mention of ſo ſtrange a propoſal, bereaved Montezuma of ſpeech, and almoſt of motion. At length he haughtily anſwered, "That perſons of his rank were not accuſtomed voluntarily to give up themſelves as priſoners; and were he mean enough to do ſo, his ſubjects would not permit ſuch an affront to be offered to their ſovereign." Cortes, unwilling to employ force, endeavoured alternately to ſoothe and intimidate him. The altercation became warm; and having continued above three hours, Velaſquez de Leon, an impetuous and gallant young man, exclaimed with impatience, "Why waſte more time in vain? Let us either ſeize him inſtantly, or ſtab him to the heart." The threatening voice and fierce geſtures with which theſe words were uttered, ſtruck Montezuma. The Spaniards, he was ſenſible, had now proceeded ſo far, as left him no hope that they would recede. His own danger was imminent, the neceſſity unavoidable. He ſaw both; and abandoning himſelf to his fate, complied with their requeſt.

106 The emperor carried to the Spaniſh quarters.

His officers were called. He communicated to them his reſolution. Though aſtoniſhed and afflicted, they preſumed not to queſtion the will of their maſter, but carried him in ſilent pomp, all bathed in tears, to the Spaniſh quarters. When it was known that the ſtrangers were conveying away the emperor, the people broke out into the wildeſt tranſports of grief and rage, threatening the Spaniards with immediate deſtruction, as the puniſhment juſtly due to their impious audacity. But as ſoon as Montezuma appeared with a ſeeming gaiety of countenance, and waved his hand, the tumult was huſhed; and upon his declaring it to be of his own choice that he went to reſide for ſome time among his new friends, the multitude, taught to revere every intimation of their ſovereign's pleaſure, quietly diſperſed.

107 Cortes rules the empire.

The Spaniards at firſt pretended to treat Montezuma with great reſpect; but ſoon took care to let him know that he was entirely in their power. Cortes wiſhed that the ſhedding the blood of a Spaniard, ſhould appear the moſt henious crime that could be committed; and therefore not only took a moſt exemplary vengeance on thoſe who had been concerned in the affair of Villa Rica, but even put the emperor himſelf in chains, till the execution of the Mexican general was over. By theſe and other inſults, he at laſt gained entirely, the aſcendant over this unhappy monarch; and he took care to improve his opportunity to the utmoſt. He ſent his emiſſaries into different parts of the kingdom, accompanied with Mexicans of diſtinction, who might ſerve both to guide and to protect them. They viſited moſt of the provinces, viewed their ſoil and productions, ſurveyed with particular care the diſtricts which yielded gold or ſilver, pitched upon ſeveral places as proper for future colonies, and endeavoured to prepare the minds of the people for ſubmitting to the Spaniſh yoke: and while they were thus employed, Cortes, in the name, and by the authority of Montezuma, degraded ſome of the principal officers in the empire, whoſe abilities or independent ſpirit excited his jealouſy; and ſubſtituted in their place perſons who he imagined would be more obſequious. One thing, however, was ſtill wanting to complete his ſecurity. He wiſhed to have ſuch a command of the lake as might enſure a retreat, if, either from levity or diſguſt, the Mexicans ſhould take arms againſt him, and break down the bridges or cauſeways, in order to encloſe him in the city.

108 By a pretence, he obtains leave to build two brigantines on the lake.

In order to obtain this without giving diſguſt to the emperor or his court, Cortes artfully inflamed the curioſity of the Indians with accounts of the Spaniſh ſhipping, and thoſe floating palaces that moved with ſuch velocity on the water, without the aſſiſtance of oars; and when he found that the monarch himſelf was extremely deſirous of ſeeing ſuch a novelty, he gave him to underſtand, that nothing was wanting to his gratification beſides a few neceſſaries from Vera Cruz, for that he had workmen in his army capable of building ſuch veſſels. The bate took with Montezuma; and he gave immediate orders that all his people ſhould aſſiſt Cortes in whatever he ſhould direct concerning the ſhipping. By this means, in a few days, two brigantines were got ready, full-rigged and equipped; and Montezuma was invited on board, to make the firſt trial of their ſailing, of which he could form no idea. Accordingly he embarked for this purpoſe, and gave orders for a great hunting upon the water, in order that all his people might be diverted with the novelty preſented by the Spaniards. On the day appointed, the royal equipage was ready early in the morning; and the lake was covered with a multitude of boats and canoes loaded with people. The Mexicans had augmented the number of their rowers on board the royal barges, with an intention to diſgrace the Spaniſh veſſels, which they regarded as clumſy, unwieldy, and heavy. But they were ſoon undeceived; a freſh gale ſtarted up, the brigantines hoiſted ſail, to the utter aſtoniſhment of all the ſpectators, and ſoon left all the canoes behind; while the monarch exulted in the victory of the Spaniards, without once conſidering that now he had effectually rivetted his own chains.

109 Montezuma owns himſelf a vaſſal to the king of Spain.

Cortes having obtained this important point, reſolved to put the condeſcenſion of the emperor to a trial ſtill more ſevere. He urged Montezuma to acknowledge himſelf a vaſſal to the crown of Caſtile; to hold his crown of him as ſuperior, and to ſubject his dominions to the payment of an annual tribute. With this requiſition, humiliating as it was, Montezuma complied. He called together the chief men of his empire, and, in a ſolemn harangue, reminded them of the traditions and prophecies which led them to expect the arrival of a people ſprung from the ſame ſtock with themſelves, in order to take poſſeſſion of the ſupreme power; he declared his belief that the Spaniards were this promiſed race; and that therefore he recogniſed the right of their monarch to govern the Mexican empire, would lay his crown at his feet, and obey him as a tributary. While uttering theſe words, Montezuma diſcovered how deeply he was affected in making ſuch a ſacrifice. Tears and groans frequently interrupted his diſcourſe. The firſt mention of ſuch a reſolution ſtruck the aſſembly dumb with aſtoniſhment. This was followed by a ſullen murmur of ſorrow mingled with indignation; which indicated ſome violent eruption of rage to be near at hand. This Cortes foreſaw, and ſeaſonably interpoſed to prevent it, by declaring that his maſter had no intention to deprive Montezuma of the royal dignity, or to make any innovation upon the conſtitution and laws of the Mexican empire. This aſſurance, added to their dread of the Spaniſh arms, and the authority of their monarch's example, extorted the conſent of the aſſembly; and the act of ſubmiſſion and homage was executed with all the formalities which the Spaniards pleaſed to preſcribe.

110 The Spaniards divide their treaſure.

111 Cortes attempts to deſtroy the Mexican idols.

Montezuma, at the requeſt of Cortes, accompanied this profeſſion of fealty and homage with a magnificent preſent to his new ſovereign; and, after his example, his ſubjects brought in very liberal contributions. The Spaniards then collected all the treaſure which had been either voluntarily beſtowed upon them at different times by Montezuma, or had been extorted from his people under various pretences; and having melted the gold and ſilver, the value of theſe, without including jewels and ornaments of various kinds, which were preſerved on account of their curious workmanſhip, amounted to 600,000 peſos. The ſoldiers were impatient to have it divided; and Cortes complied with their deſire. A fifth of the whole was ſet apart as the tax due to the king. Another fifth was allowed to Cortes as commander. The ſums advanced by the governor of Cuba, who had originally fitted out the expedition, were then deducted. The remainder was then divided among the army, including the garriſon of Vera Cruz, in proportion to their different ranks; and after ſo many deductions, the ſhare of a private man did not exceed 100 peſos. This ſum fell ſo far below their ſanguine expectations, that it required all the addreſs, and no ſmall exertions of the liberality of Cortes, to prevent an open mutiny. However, he at laſt reſtored tranquillity; but had no ſooner eſcaped this danger, than he involved himſelf, by his imprudent zeal for religion, in one much worſe. Montezuma, though often importuned, had obſtinately refuſed to change his religion, or aboliſh the ſuperſtitious rites which had been for ſuch a long time practiſed throughout his dominions. This at laſt tranſported the Spaniards with ſuch rage, that, in a ſally of zeal, he led out his ſoldiers in order to throw down the idols in the great temple by force. But the prieſts taking arms in defence of their altars, and the people crowding with great ardour to ſupport them, Cortes's prudence over-ruled his zeal, and induced him to deſiſt from his raſh attempt, after diſlodging the idols from one of the ſhrines, and placing in their ſtead an image of the Virgin Mary.

112 Which produces a general diſaffection.

113 The Spaniards are commanded to depart.

From this moment the Mexicans began to meditate the expulſion or the deſtruction of the Spaniards. The prieſts and leading men held frequent meetings with Montezuma for this purpoſe. But as any violent attempt might have proved fatal to the captive monarch, it was thought proper firſt to try more gentle means. Having called Cortes into his preſence, he obſerved, that now, as all the purpoſes of his embaſſy were fully accompliſhed, the gods had declared their will, and the people ſignified their deſire, that he and his followers ſhould inſtantly depart out of the empire. With this he required them to comply, or unavoidable deſtruction would fall ſuddenly on their heads. This unexpected requiſition, as well as the manner in which it was delivered, alarmed Cortes. However, he ſuppoſed that more might be gained by a feigned compliance than by open reſiſtance; and therefore replied with great compoſure, that he had already begun to prepare for his return; but as he had deſtroyed the veſſels in which he arrived, ſome time was requiſite for building other ſhips. This appeared reaſonable; and a number of Mexicans were ſent to Vera Cruz to cut down timber, and ſome Spaniſh carpenters were appointed to ſuperintend the work.

114 An armament ſent from Cuba againſt Cortes.

Cortes flattered himſelf, that, during this interval, he might either find means to avert the threatened danger, or receive ſuch reinforcements as would enable him to defend himſelf. Nine months had now elapſed ſince Portocarrero and Montejo had ſailed with his diſpatches to Spain; and he daily expected a return with a confirmation of his authority from the king, without which all that had done ſerved only to mark him out as an object of puniſhment. While he remained in great anxiety on this account, news were brought that ſome ſhips had appeared on the coaſt. Theſe were imagined by Cortes to be a reinforcement ſent him from Spain: but his joy was of ſhort continuance, for a courier very ſoon arrived from Vera Cruz, with certain information that the armament was fitted out by Velaſquez, the governor of Cuba; and inſtead of bringing ſuccours, threatened them with immediate deſtruction.

Velaſquez had been excited to this hoſtile meaſure chiefly through the indiſcretion, or rather treachery, of the meſſengers of Cortes; who, contrary to his expreſs injunctions, had landed on the iſland of Cuba, and given intelligence of all that had paſſed: and Velaſquez, tranſported with rage at hearing of the proceedings of Cortes, had now ſent againſt him this armament; conſiſting of 18 ſhips, which carried 80 horſemen, 800 infantry, of which 80 were muſketeers, and 120 croſs-bowmen, commanded by a brave officer named *Pamphilo de Narvaez*; whoſe inſtructions were, to ſeize Cortes and his principal officers, to ſend them priſoners to him, and then to complete the diſcovery and conqueſt of the country in his name. This proved a moſt afflicting piece of news to Cortes. However, thinking it imprudent to attempt any thing againſt his countrymen at firſt by force, he ſent his chaplain Olmedo with propoſals of accommodation. Narvaez rejected his propoſals with ſcorn; but his followers were leſs violent in their reſentments. Olmedo delivered many letters to them, either from Cortes himſelf, or from his officers their ancient friends and companions. Theſe Cortes had artfully accompanied with preſents of rings, chains of gold, and other trinkets of value; which inſpired thoſe needy adventurers with high ideas of the wealth he had acquired, and with envy of the good fortune of thoſe who were engaged in his ſervice. Some, from hopes of becoming ſharers in theſe rich ſpoils, declared for an immediate accommodation; while others were for the ſame pacific meaſure, through fear of ſubverting the Spaniſh power entirely in a country where it was ſo imperfectly eſtabliſhed. Narvaez diſregarded both; and, by a proclamation, denounced Cortes and his adherents rebels, and enemies to their country.

115 Which is defeated by that general.

Cortes having now no reſource but in war, left 150 men under the command of Pedro de Alvarado, an officer of great bravery, and much reſpected by the Mexicans, to guard the capital and the captive emperor; while he himſelf marched with the remainder, to meet his formidable opponent, who had taken poſſeſſion of Zempoalla. Even after being reinforced by Sandoval his governor of Vera Cruz, the force of Cortes did not exceed 250 men. He hoped for ſucceſs chiefly from the rapidity of his motions and the poſſibility of ſurpriſing his enemies; and as he chiefly dreaded their cavalry, he armed his ſoldiers with long ſpears, accuſtoming them to that deep and compact arrangement which the uſe of this formidable weapon enabled them to aſſume. As he advanced, however, he repeated his propoſals of accomodation; but theſe being conſtantly rejected, and a price ſet upon his head, he at laſt attacked Narvaez in the night-time, entirely defeated and took him priſoner, obliging all his troops to own allegiance to himſelf.

116
Dangerous ſituation of the Spaniards left at Mexico.

Nothing could be more ſeaſonable than this victory, by which Cortes found his army very conſiderably increaſed; for moſt of the ſoldiers of Narvaez choſe rather to follow Cortes than to return to Cuba, whither the conqueror had offered to ſend them if they choſe. His affairs at Mexico, in the mean time, were in the utmoſt danger of being totally ruined; and had this deciſive victory been delayed but a few days longer, he muſt have come too late to ſave his companions. A ſhort time after the defeat of Narvaez, a courier arrived from Mexico with the diſagreeable intelligence that the Mexicans had taken arms; and having ſeized and deſtroyed the two brigantines which he had built in order to ſecure the command of the lake, had attacked the Spaniards in their quarters, killed ſome, and wounded many more, burnt their magazine of proviſions, and, in ſhort, carried on hoſtilities with ſuch fury, that though Alvarado and his men defended themſelves with undaunted reſolution, they muſt either be cut off by famine, or ſink under the multitude of their enemies. This revolt was excited by motives which rendered it ſtill more alarming. On the departure of Cortes for Zempoalla, the Mexicans flattered themſelves, that the long-expected opportunity of reſtoring their ſovereign to liberty, and driving out the Spaniards, was arrived; and conſultations were accordingly held for bringing about both theſe events. The Spaniards in Mexico, conſcious of their own weakneſs, ſuſpected and dreaded theſe machinations; but Alvarado, who had neither the prudence nor the addreſs of Cortes, took the worſt method imaginable to overcome them. Inſtead of attempting to ſoothe or cajole the Mexicans, he waited the return of one of their ſolemn feſtivals, when the principal perſons in the empire were dancing, according to cuſtom, in the court of the great temple; he ſeized all the avenues which led to it; and, allured partly by the rich ornaments which they wore in honour of their gods, and partly by the facility of cutting off at once the authors of that conſpiracy which he dreaded, he fell upon them, unarmed and unſuſpicious of danger, and maſſacred a great number; none eſcaping but ſuch as made their way over the battlements of the temple. An action ſo cruel and treacherous filled not only the city, but the whole empire, with indignation and rage; and the Mexicans immediately proceeded in the manner abovementioned.

117
Cortes allowed to return to Mexico;

Cortes advanced with the utmoſt celerity to the relief of his diſtreſſed companions; but as he paſſed along, had the mortification to find that the Spaniards were generally held in abhorrence. The principal inhabitants had deſerted the towns through which he paſſed; no perſon of note appeared to meet him with the uſual reſpect; nor were proviſions brought to his camp as uſual. Notwithſtanding theſe ſigns of averſion and horror, however, the Mexicans were ſo ignorant of the military art, that they again permitted him to enter the capital without oppoſition; though it was in their power to have eaſily prevented him, by breaking down the bridges and cauſeways which led to it.

118
But is furiouſly attacked by the natives.

Cortes was received by his companions with the utmoſt joy; and this extraordinary ſucceſs ſo far intoxicated the general himſelf, that he not only neglected to viſit Montezuma, but expreſſed himſelf very contemptuouſly concerning him. Theſe expreſſions being reported among the Mexicans, they all at once flew to arms, and made ſuch a violent and ſudden attack, that all the valour and ſkill of Cortes were ſcarce ſufficient to repel them. This produced great uneaſineſs among the ſoldiers of Narvaez, who had imagined there was nothing to do but to gather the ſpoils of a conquered country. Diſcontent and murmurings, however, were now of no avail; they were incloſed in an hoſtile city, and, without ſome extraordinary exertions, were inevitably undone. Cortes therefore, made a deſperate ſally; but, after exerting his utmoſt efforts for a whole day, was obliged to retire with the loſs of 12 killed, and upwards of 60 wounded. Another ſally was attempted with the like bad ſucceſs, and in it Cortes himſelf was wounded in the hand.

119
Montezuma killed.

The Spaniſh general was now thoroughly convinced of his error; and therefore betook himſelf to the only reſource which was left; namely, to try what effect the interpoſition of Montezuma would have to ſoothe or overawe his ſubjects. When the Mexicans approached the next morning to renew the aſſault, that unfortunate prince, at the mercy of the Spaniards, and reduced to the ſad neceſſity of becoming the inſtrument of his own diſgrace, and of the ſlavery of his people, advanced to the battlements in his royal robes, and with all the pomp in which he uſed to appear on ſolemn occaſions. At the ſight of their ſovereign, whom they had been long accuſtomed to reverence almoſt as a god, the Mexicans inſtantly forebore their hoſtilities, and many proſtrated themſelves on the ground: but when he addreſſed them in favour of the Spaniards, and made uſe of all the arguments he could think of to mitigate their rage, they teſtified their reſentment with loud murmurings; and at length broke forth with ſuch fury, that before the ſoldiers, appointed to guard Montezuma, had time to cover him with their ſhields, he was wounded with two arrows, and a blow on his temple with a ſtone ſtruck him to the ground. On ſeeing him fall, the Mexicans inſtantly fled with the utmoſt precipitation: but the unhappy monarch, now convinced that he was become an object of contempt even to his own ſubjects, obſtinately refuſed all nouriſhment; and thus in a ſhort time ended his days.

120
A terrible engagement between the Spaniards and Mexicans.

On the death of Montezuma, Cortes having loſt all hope of bringing the Mexicans to any terms of peace prepared for retreat. But his antagoniſts, having taken poſſeſſion of a high tower in the great temple, which overlooked the Spaniſh quarters, and placing there a garriſon of their principal warriors, the Spaniards were ſo much expoſed to their miſſile weapons that none could ſtir without danger of being killed or wounded. From this poſt, therefore, it was neceſſary to diſlodge them at any rate; and Juan de Eſcobar, with a large detachment of choſen ſoldiers, was ordered to make the attack. But Eſcobar, though a valiant officer, and though he exerted his utmoſt efforts, was thrice repulſed. Cortes, however, ſenſible that not only his reputation, but the ſafety of his army, depended on the ſucceſs of this aſſault, cauſed a buckler to be tied to his arm, as he could not manage it with his wounded hand, and ruſhed with his drawn ſword among the thickeſt of the combatants. Encouraged by the preſence of their general, the Spaniards returned to the charge with ſuch vigour, that they gradually forced their way up the ſteps, and drove the Mexicans to the platform at the top of the tower. There a dreadful carnage began; when two young Mexicans of high rank, obſerving Cortes, as he animated his ſoldiers, reſolved to ſacrifice their own lives in order to cut off the author of ſo many calamities which deſolated their country. They approached him in a ſuppliant poſture, as if they intended to lay down their arms; and ſeizing him in a moment, hurried him towards the battlements, over which they threw themſelves headlong, in hopes of dragging him along with them. But Cortes, by his ſtrength and agility, diſengaged himſelf from their graſp; ſo that the two Mexicans periſhed alone.

As ſoon as the Spaniards became maſters of the tower, they ſet fire to it, and without further moleſtation continued the preparations for their retreat. This became the more neceſſary, as their enemies, aſtoniſhed at this laſt effort of their valour, had now entirely changed their ſyſtem of hoſtility; and, inſtead of inceſſant attacks, endeavoured by barricading the ſtreets, and breaking down the cauſeways, to cut off the communication of the Spaniards with the continent, and thus to ſtarve an enemy whom they could not ſubdue. The firſt point to be determined was, whether they ſhould march out openly in the face of day, when they could diſcern every danger, or whether they ſhould endeavour to retire ſecretly in the night. The latter was preferred, partly from hopes that the ſuperſtition of the Mexicans would prevent them from attacking them in the night, and partly from their own ſuperſtition in giving credit to the predictions of a private ſoldier, who pretended to aſtrology, and aſſured them of ſucceſs if they retreated in this manner. Towards midnight, therefore, they began their march, in three diviſions. Sandoval led the van; Pedro Alvarado and Velaſquez de Leon had the conduct of the rear; and Cortes commanded in the centre, where he placed the priſoners, among whom were a ſon and two daughters of Montezuma, together with ſeveral Mexicans of diſtinction; the artillery, baggage, and a portable bridge of timber intended to be laid over the breaches in the cauſeway. They marched in profound ſilence along the cauſeway which led to Tacuba, becauſe it was ſhorter than any of the reſt, and, lying moſt remote from the road towards Tlaſcala and the ſea-coaſt, had been left moſt entire by the Mexicans.

121
Cortes retreats with great loſs.

They reached the firſt breach in the cauſeway without moleſtation, hoping that their retreat was undiſcovered. But the Mexicans had not only watched all their motions, but made preparations for a moſt formidable attack. While the Spaniards were intent upon placing their bridges in the breach, and occupied in conducting their horſes and artillery along it, they were ſuddenly alarmed with the ſound of warlike inſtruments, and found themſelves aſſaulted on all ſides by an innumerable multitude of enemies. Unfortunately the wooden bridge was wedged ſo faſt in the mud by the weight of the artillery, that it was impoſſible to remove it. Diſmayed at this accident, the Spaniards advanced with precipitation to the ſecond breach. The Mexicans hemmed them in on every ſide; and though they defended themſelves with their uſual courage, yet, crowded as they were in a narrow cauſeway, their diſcipline and military ſkill were of little avail; nor did the obſcurity of the night allow them to derive much advantage from their fire-arms or the ſuperiority of their other weapons. At laſt the Spaniards, overborne with the numbers of their enemies, began to give way, and in a moment the confuſion was univerſal. Cortes, with about 100 foot-ſoldiers, and a few horſe, forced his way over the two remaining breaches in the cauſeway, the bodies of the dead ſerving to fill up the chaſms, and reached the main land. Having formed them as ſoon as they arrived, he returned with ſuch as were yet capable of ſervice, to aſſiſt his friends in their retreat. He met with part of his ſoldiers who had forced their way through the enemy, but found many more overwhelmed by the multitude of their aggreſſors, or periſhing in the lake; and heard the grievous lamentations of others whom the Mexicans were carrying off in triumph to be ſacrificed to the god of war.

In this fatal retreat more than one half of Cortes's army periſhed, together with many officers of diſtinction. All the artillery, ammunition, and baggage, were loſt; the greater part of the horſes and above 2000 Tlaſcalans were killed, and only a very ſmall part of their treaſure ſaved. The firſt care of the Spaniſh general was to find ſome ſhelter for his wearied troops; for, as the Mexicans infeſted them on every ſide, and the people of Tacuba began to take arms, he could not continue in his preſent ſtation. At laſt he diſcovered a temple ſeated on an eminence, in which he found not only the ſhelter he wanted, but ſome proviſions; and though the enemy did not intermit their attacks throughout the day, they were without much difficulty prevented from making any impreſſion. For ſix days after, they continued their march through a barren, ill cultivated, and thinly peopled country, where they were often obliged to feed on berries, roots, and the ſtalks of green maize; at the ſame time they were harraſſed without intermiſſion by large parties of Mexicans, who attacked them on all ſides. On the ſixth day they reached Otumba, not far from the road between Mexico and Tlaſcala. Early next morning

122 The battle of Otumba.

123 Mexicans defeated.

they began to advance towards it, flying parties of the enemy ſtill hanging on their rear; and amidſt the inſults with which they accompanied their hoſtilities, Donna Marina remarked, that they often exclaimed with exultation, "Go on, robbers; go to the place where you ſhall quickly meet the vengence due to your crimes." The meaning of this threat the Spaniards did not comprehend, until they reached the ſummit of an eminence before them. There a ſpacious valley opened to their view, covered with a vaſt army as far as the eye could reach. The Mexicans, while with one body of their troops they haraſſed the Spaniards in their retreat, had aſſembled their principal force on the other ſide of the lake; and marching along the road which led directly to Tlaſcala, poſted it in the plain of Otumba, through which they knew Cortes muſt paſs. At the ſight of this incredible multitude, which they could ſurvey at once from the riſing ground, the Spaniards were aſtoniſhed, and even the boldeſt began to diſpair. But Cortes, without allowing their fears time to operate, after warning them briefly that no alternative remained but to conquer or die, led them inſtantly to the charge. The Mexicans waited their approach with unuſual fortitude: yet ſuch was the ſuperiority of the Spaniſh diſcipline and arms, that the impreſſion of this ſmall body was irreſiſtible; and which ever way its force was directed, it penetrated and diſperſed the moſt numerous battalions. But while theſe gave way in one quarter, new combatants advanced from another; and the Spaniards, though ſucceſsful in every attack, were ready to ſink under theſe repeated efforts, without ſeeing any end to their toil, or any hope of victory. At that time Cortes obſerved the great ſtandard of the empire, which was carried before the Mexican general, advancing; and fortunately recollecting to have heard, that on the fate of it depended the event of every battle, he aſſembled a few of his braveſt officers, whoſe horſes were ſtill capable of ſervice, and, placing himſelf at their head, puſhed towards the ſtandard with ſuch impetuoſity that he bore down every thing before him. A choſen body of nobles, who guarded the ſtandard, made ſome reſiſtance, but were ſoon broken. Cortes, with a ſtroke of his lance, wounded the Mexican general, and threw him to the ground. One of his followers alighting, put an end to his life, and laid hold of the imperial ſtandard. The moment that their leader fell, and the ſtandard, towards which all directed their eyes, diſappeared, an univerſal panic ſtruck the Mexicans; and, as if the bond which held them together had been diſſolved, every enſign was lowered, each ſoldier threw away his weapons, and fled with precipitation to the mountains. The Spaniards, unable to purſue them far, returned to collect the ſpoils of the field; and theſe were ſo valuable as to be ſome compenſation for the wealth which they had loſt in Mexico; for in the enemy's army were moſt of their principal warriors dreſſed out in their richeſt ornaments, as if they had been marching to aſſured victory.

The day after this important action (being July 8th 1520), the Spaniards entered the Tlaſcalan territories, where they were received with the moſt cordial friendſhip. Cortes endeavoured to avail himſelf of this diſpoſition as much as poſſible; for which purpoſe he diſtributed among them the rich ſpoils taken at Otumba with ſuch a liberal hand, that he made himſelf ſure of obtaining from the republic whatever he ſhould deſire. He drew a ſmall ſupply of ammunition, and two or three field-pieces, from his ſtores at Vera Cruz. He diſpached an officer of confidence with four ſhips of Narvaez's fleet to Hiſpaniola and Jamaica, to engage adventurers, and to purchaſe horſes, gunpowder, and other military ſtores. And as he knew that it would be in vain to attempt the reduction of Mexico, unleſs he could ſecure the command of the lake, he gave orders to prepare, in the mountains of Tlaſcala, materials for building 12 brigantines, ſo that they might be carried thither in pieces, ready to be put together, and launched when he ſtood in need of their ſervice. But, in the mean time, his ſoldiers, alarmed at the thoughts of being expoſed to ſuch calamities a ſecond time, preſented a remonſtrance to their general, in which they repreſented the imprudence of attacking a powerful empire with his ſhattered forces, and formally required him to return back to Cuba. All the eloquence of Cortes could now only prevail with them to delay their departure for ſome time, when he promiſed to diſmiſs ſuch as ſhould deſire it. However, this was only a pretence; for Cortes, in fact, had the conqueſt of Mexico as much at heart as ever. Without giving his ſoldiers an opportunity of caballing, therefore, he daily employed them againſt the people of the neighbouring provinces, who had cut off ſome detachments of Spaniards during his misfortunes at Mexico; and by which, as he was conſtantly attended with ſucceſs, his men ſoon reſumed their wonted ſenſe of ſuperiority.

124 Cortes receives an unexpected reinforcement.

But all the efforts of Cortes could have been of little avail, had he not unexpectedly obtained a reinforcement of Spaniſh ſoldiers. The governor of Cuba, to whom the ſucceſs of Narvaez appeared an event of infallible certainty, having ſent two ſmall ſhips after him with new inſtructions, and a ſupply of men and military ſtores, the officer whom Cortes had appointed to command on the coaſt artfully decoyed them into the harbour of Vera Cruz, ſeized the veſſels, and eaſily perſuaded the ſoldiers to follow the ſtandard of a more able leader than him whom they were deſtined to join. Soon after, three ſhips of more conſiderable force came into the harbour ſeparately. Theſe belonged to an armament fitted out by Franciſco de Garay, governor of Jamaica, who had long aimed at dividing with Cortes the glory and gain of annexing the empire of Mexico to the crown of Caſtile. They had, however, unadviſedly made their attempt on the northern provinces, where the country was poor, and the inhabitants fierce and warlike; ſo that, after a ſucceſſion of diſaſters, they were now obliged to venture into Vera Cruz, and caſt themſelves upon the mercy of their countrymen; and here they alſo were ſoon perſuaded to throw off their allegiance to their maſter, and to enliſt with Cortes. About the ſame time a ſhip arrived from Spain, freighted by ſome private adventurers, with military ſtores; and the cargo was eagerly purchaſed by Cortes, while the crew following the example of the reſt, joined him at Tlaſcala.

From theſe various quarters, the army of Cortes was augmented with 180 men and 20 horſes; by which means he was enabled to diſmiſs ſuch of the ſoldiers of Narvaez as were moſt troubleſome and diſcontented; after the departure of whom he ſtill muſtered 550 infantry, of whom 80 men were armed with muſkets or croſs-bows, 40 horſemen, and nine pieces of artillery.

125 He ſets out again for Mexico. At the head of theſe, with 10,000 Tlaſcalans and other friendly Indians, he began his march towards Mexico, on the 28th of December, ſix months after his fatal retreat from that city.

The Mexicans, in the mean time, had made the beſt preparations they could for oppoſing ſuch a formidable enemy. On the death of Montezuma, his brother Quetlavaca was raiſed to the throne; and he had an immediate opportunity of ſhowing that he was worthy of their choice, by conducting in perſon thoſe fierce attacks which obliged the Spaniards to retire from his capital.

126 Preparations of the Mexicans, for their defence. His prudence in guarding againſt the return of the invaders was equal to the ſpirit he had ſhown in driving them out. He repaired what the Spaniards had ruined in the city, ſtrengthened it with ſuch fortifications as his people could erect; and beſides filling his magazines with the uſual implements of war, gave directions to make long ſpears, headed with the ſwords and daggers which they had taken from the Spaniards, in order to annoy the cavalry. But in the midſt of theſe preparations he was taken off by the ſmall-pox; and Guatimozin, his nephew and ſon-in-law, raiſed to the throne.

As ſoon as Cortes entered the enemy's territories, he diſcovered various preparations to obſtruct his progreſs. But his troops forced their way with little difficulty; and took poſſeſſion of Tezeuco, the ſecond city of the empire, ſituated on the banks of the lake, about 20 miles from Mexico. Here he determined to eſtabliſh his head quarters, as the moſt proper ſtation for launching his brigantines, as well as for making his approaches to the capital. In order to render his reſidence there more ſecure, he depoſed the cazique or chief, who was at the head of that community under pretence of ſome defect in his title, and ſubſtituted in his place a perſon whom a faction of the nobles pointed out as the right heir of that dignity. Attached to him by this benefit, the new cazique and his adherents ſerved the Spaniards with inviolable fidelity.

As the conſtruction of the brigantines advanced ſlowly under the unſkilful hands of ſoldiers and Indians, whom Cortes was obliged to employ in aſſiſting three or four carpenters who happened fortunately to be in his ſervice, and as he had not yet received the reinforcement which he expected from Hiſpaniola, he was not in a condition to turn his arms directly againſt the capital. To have attacked a city ſo populous, ſo well prepared for defence, and in a ſituation of ſuch peculiar ſtrength, muſt have expoſed his troops to inevitable deſtruction. Three months elapſed before the materials for conſtructing the brigantines were finiſhed, and before he heard any thing with reſpect to the ſucceſs of his negociation in Hiſpaniola. This, however,

127 Cortes makes great progreſs. was not a ſeaſon of inaction to Cortes. He attacked ſucceſſively ſeveral of the towns ſituated around the lake; and though all the Mexican power was exerted to obſtruct his operations, he either compelled them to ſubmit to the Spaniſh crown, or reduced them to ruins. Other towns he endeavoured to conciliate by more gentle means; and though he could not hold any intercourſe with the inhabitants but by the intervention of interpreters, yet, under all the diſadvantage of that tedious and imperfect mode of communication, he had acquired ſuch thorough knowledge of the ſtate of the country, as well as of the diſpoſitions of the people, that he conducted his negociations and intrigues with aſtoniſhing dexterity and ſucceſs. Moſt of the cities adjacent to Mexico were originally the capitals of ſmall independent ſtates; and ſome of them having been but lately annexed to the Mexican empire, ſtill retained the remembrance of their ancient liberty, and bore with impatience the rigorous yoke of their new maſters. Cortes having early obſerved ſymptoms of their diſaffection, availed himſelf of this knowledge to gain their confidence and friendſhip. By offering with confidence to deliver them from the odious dominion of the Mexicans, and by liberal promiſes of more indulgent treatment if they would unite with him againſt their oppreſſors, he prevailed on the people of ſeveral conſiderable diſtricts, not only to acknowledge the king of Caſtile as their ſovereign, but to ſupply the Spaniſh camp with proviſions, and to ſtrengthen his army with auxiliary troops. Guatimozin, on the firſt appearance of defection among his ſubjects, exerted himſelf with vigour to prevent or to puniſh their revolt; but, in ſpite of his efforts, the ſpirit continued to ſpread. The Spaniards gradually acquired new allies; and with deep concern he beheld Cortes arming againſt his empire thoſe very hands which ought to have been active in his defence, and ready to advance againſt the capital at the head of a numerous body of his own ſubjects.

While, by theſe various methods, Cortes was gradually circumſcribing the Mexican power within ſuch narrow limits that his proſpect of overturning it ſeemed neither to be uncertain nor remote, all his ſchemes were well nigh defeated by a conſpiracy againſt his own perſon, and which was diſcovered only a ſhort time before it was to have been executed. Though many were concerned, Cortes did not think proper to puniſh any more than the principal ringleader, whom he cauſed immediately to be hanged; and then, without allowing them leiſure to ruminate on what had happened, and as the moſt effectual means of preventing the return of a mutinous ſpirit, he determined to call forth his troops immediately to action. Fortunately a proper occaſion for this occurred, without his ſeeming to court it. He received intelligence, that the materials for building the brigantines were at length completely finiſhed, and waited only for a body of Spaniards to conduct them to Tezeuco. The command of this convoy, conſiſting of 200 foot-ſoldiers, 15 horſemen, and 2 field-pieces, he gave to Sandoval, who by the vigilance, activity, and courage, which he manifeſted on every occaſion, was growing daily in his confidence, and in the eſtimation of his fellow-ſoldiers. The ſervice was no leſs ſingular than important; the beams, the planks, the maſts, the cordage, the ſails, the iron-work, and all the infinite variety of articles requiſite for the conſtruction of 13 brigantines were to be carried 60 miles over land, thro' a mountainous country, by people who were unacquainted with the miniſtry of domeſtic animals, or the aid of machines to facilitate any work of labour. The

Tlaſcalans furniſhed 8000 *Tamenes*, an inferior order of men deſtined for ſervile taſks, to carry the materials on their ſhoulders, and appointed 15,000 warriors to accompany and defend them. Sandoval made the diſpoſition for their progreſs with great propriety, placing the Tamenes in the centre, one body of warriors in the front, another in the rear, with conſiderable parties to cover the flanks. To each of theſe he joined ſome Spaniards, not only to aſſiſt them in danger, but to accuſtom them to regularity and ſubordination. Parties of Mexicans frequently appeared hovering around them on the high grounds: but perceiving no proſpect of ſucceſs in attacking an enemy continually on his guard, and prepared to receive them, they did not venture to moleſt him; and Sandoval had the glory of conducting ſafely to Tezeuco a convoy on which all the future operations of his countrymen depended.

128 The Spaniards receive another reinforcement.

This was followed by another event of no leſs moment. Four ſhips arrived at Vera Cruz from Hiſpaniola, with 200 ſoldiers, 80 horſes, two battering cannon, and a conſiderable ſupply of ammunition and arms. Elevated with obſerving that all his preparatory ſchemes, either for recruiting his own army or impairing the force of the enemy, had now produced their full effect, Cortes, impatient to begin the ſiege in form, haſtened the launching of the brigantines. To facilitate this, he had employed a vaſt number of Indians, for two months, in deepening the ſmall rivulet which runs by Tezeuco into the lake, and in forming it into a canal near two miles in length; and though the Mexicans, aware of his intentions, as well as of the danger which threatened them, endeavoured frequently to interrupt the labourers, or to burn the brigantines, the work was at laſt completed. On the 28th of April, all the Spaniſh troops, together with auxiliary Indians, were drawn up on the banks of the canal; and with extraordinary military pomp, heightened and rendered more ſolemn by the celebration of the moſt ſacred rites of religion, the brigantines were launched. As they fell down the canal in order, Father Olmedo bleſſed them, and gave each its name. Every eye followed them with wonder and hope, until they entered the lake, when they hoiſted their ſails, and bore away before the wind. A general ſhout of joy was raiſed; all admiring that bold inventive genius, which, by means ſo extraordinary, that their ſucceſs almoſt exceeded belief, had acquired the command of a fleet, without the aid of which Mexico would have continued to ſet the Spaniſh power and arms at defiance.

129 The city beſieged.

Cortes determined to attack the city from three different quarters; from Tezeuco on the eaſt ſide of the lake, from Tacuba on the weſt, and from Cuyocan towards the ſouth. Thoſe towns were ſituated on the principal cauſeways which led to the capital, and intended for their defence. He appointed Sandoval to command in the firſt, Pedro de Alvarado in the ſecond, and Chriſtoval de Olid in the third; allotting to each a numerous body of Indian auxiliaries, together with an equal diviſion of Spaniards, who, by the junction of the troops from Hiſpaniola, amounted now to 86 horſemen, and 818 foot-ſoldiers; of whom 118 were armed with muſkets or croſs-bows. Their train of artillery conſiſted of three battering cannon, and 15 field-pieces. He reſerved for himſelf, as the ſtation of greateſt importance and danger, the conduct of the brigantines, each armed with one of his ſmall cannon, and manned with 25 Spaniards.

As Alvarado and Olid proceeded towards the poſts aſſigned them, they broke down the aqueducts which the ingenuity of the Mexicans had erected for conveying water into the capital, and, by the diſtreſs to which this reduced the inhabitants, gave a beginning to the calamities which they were deſtined to ſuffer. Alvarado and Olid found the towns, of which they were ordered to take poſſeſſion, deſerted by their inhabitants, who had fled for ſafety to the capital, where Guatimozin had collected the chief force of his empire, as there alone he could hope to make a ſucceſsful ſtand againſt the formidable enemies who were approaching to aſſault him.

130 The Spaniards defeat the Mexicans, and become maſters of the lake.

The firſt effort of the Mexicans was to deſtroy the fleet of brigantines, the fatal effects of whoſe operations they foreſaw and dreaded. Though the brigantines, after all the labour and merit of Cortes in forming them, were of inconſiderable bulk, rudely conſtructed, and manned chiefly with landmen, hardly poſſeſſed of ſkill enough to conduct them, they muſt have been objects of terror to a people unacquainted with any navigation but that of their lake, and poſſeſſed of no veſſel larger than a canoe. Neceſſity, however, urged Guatimozin to hazard the attack; and hoping to ſupply by numbers what he wanted in force, he aſſembled ſuch a multitude of canoes as covered the face of the lake. They rowed on boldly to the charge, while the brigantines, retarded by a dead calm, could ſcarcely advance to meet them. But as the enemy drew near, a breeze ſuddenly ſprung up; in a moment the ſails were ſpread, and the brigantines with irreſiſtible impetuoſity broke their feeble opponents, overſet many canoes, and diſſipated the whole armament with ſuch ſlaughter, as convinced the Mexicans, that the progreſs of the Europeans in knowledge and arts rendered their ſuperiority greater on this new element than they had hitherto found it by land.

From that time Cortes remained maſter of the lake: and the brigantines not only preſerved a communication between the Spaniards in their different ſtations, though at conſiderable diſtance from each other; but were employed to cover the cauſeways on each ſide, and keep off the canoes, when they attempted to annoy the troops as they advanced towards the city. He formed the brigantines in three diviſions, allotting one to each ſtation, with orders to ſecond the operations of the officer who commanded there. From all the three ſtations he puſhed on the attack againſt the city with equal vigour; but in a manner ſo very different from that whereby ſieges are conducted in regular war, as might appear no leſs improper than ſingular to perſons unacquainted with his ſituation. Each morning his troops aſſaulted the barricades which the enemy had erected on the cauſeways, forced their way over the trenches which they had dug, and through the canals where the bridges were broken down, and endeavoured to penetrate into the heart of the city, in hopes of obtaining ſome deciſive advantage, which might force the enemy to ſurrender, and terminate the war at once; but when the obſtinate valour of the Mexicans rendered the efforts of the day ineffectual, the Spaniards retired in the evening to their former quarters. Thus their toil and danger were, in ſome meaſure, continually renewed, the Mexicans repairing in the night what the Spaniards had deſtroyed through the day, and recovering the poſts from which they had driven them. But neceſſity preſcribed this ſlow and untoward mode of operation. The number of his troops was ſo ſmall, that Cortes durſt not, with a handful of men, attempt to make a lodgement in a city where he might be ſurrounded and annoyed by ſuch a multitude of enemies. The remembrance of what he had already ſuffered by the ill-judged confidence with which he had ventured into ſuch a dangerous ſituation, was ſtill freſh in his mind. The Spaniards, exhauſted with fatigue, were unable to guard the various poſts which they daily gained; and though their camp was filled with Indian auxiliaries, they durſt not devolve this charge upon them, becauſe they were ſo little accuſtomed to diſcipline, that no confidence could be placed in their vigilance. Beſides this, Cortes was extremely ſolicitous to preſerve the city as much as poſſible from being deſtroyed, both as he deſtined it to be the capital of his conqueſts, and wiſhed that it might remain as a monument of his glory. From all theſe conſiderations, he adhered obſtinately, for a month after the ſiege was opened, to the ſyſtem which he had adopted. The Mexicans, in their own defence, diſplayed valour which was hardly inferior to that with which the Spaniards attacked them. On land, on water, by night and by day, one furious conflict ſucceeded to another. Several Spaniards were killed, more wounded, and all were ready to ſink under the toils of unintermitting ſervice, which were rendered more intolerable by the injuries of the ſeaſon, the periodical rains being now ſet in with their uſual violence.

Aſtoniſhed and diſconcerted with the length and difficulties of the ſiege, Cortes determined to make one great effort to get poſſeſſion of the city before he relinquiſhed the plan which he had hitherto followed, and had recourſe to any other mode of attack. With this view, he ſent inſtructions to Alvarado and Sandoval to advance with their diviſions to a general aſſault, and took the command in perſon of that poſted on the cauſeway of Cuyocan. Animated by his preſence, and the expectation of ſome deciſive event, the Spaniards puſhed forward with irreſiſtible impetuoſity. They broke through one barricade after another, forced their way over the ditches and canals, and having entered the city, gained ground inceſſantly, in ſpite of the multitude and ferocity of their opponents. Cortes, though delighted with the rapidity of his progreſs, did not forget that he might ſtill find it neceſſary to retreat and in order to ſecure it, appointed Julian de Alderete, a captain of chief note in the troops which he had received from Hiſpaniola, to fill up the canals and gaps in the cauſeway as the main body advanced. That officer deeming it inglorious to be thus employed, while his companions were in the heat of action and the career of victory, neglected the important charge committed to him, and hurried on inconſiderately to mingle with the combatants. The Mexicans, whoſe military attention and ſkill were daily improving, no ſooner obſerved this, than they carried an account of it to their monarch.

Guatimozin inſtantly diſcerned the conſequences of the error which the Spaniards had committed, and, with admirable preſence of mind, prepared to take advantage of it. He commanded the troops poſted in the front to ſlacken their efforts, in order to allure the Spaniards to puſh forward, while he diſpatched a large body of choſen warriors through different ſtreets, ſome by land, and others by water, towards the great breach in the cauſeway, which had been left open. On a ſignal which he gave, the prieſts in the great temple ſtruck the great drum conſecrated to the god of war. No ſooner did the Mexicans hear its doleful ſolemn ſound, calculated to inſpire them with contempt of death and with enthuſiaſtic ardour, than they ruſhed upon the enemy with frantic rage. The Spaniards, unable to reſiſt men urged on no leſs by religious fury than hope of ſucceſs, began to retire at firſt leiſurely, and with a good countenance: but as the enemy preſſed on, and their own impatience to eſcape increaſed, the terror and confuſion became ſo general, that when they arrived at the gap in the cauſeway, Spaniards and Tlaſcalans, horſemen and infantry, plunged in promiſcuouſly, while the Mexicans ruſhed upon them fiercely from every ſide, their light canoes carrying them through ſhoals which the brigantines could not approach. In vain did Cortes attempt to ſtop and rally his flying troops; fear rendered them regardleſs of his intreaties or commands. Finding all his endeavours to renew the combat fruitleſs, his next care was to ſave ſome of them who had thrown themſelves into the water; but while thus employed, with more attention to their ſituation than to his own, ſix Mexican captains ſuddenly laid hold of him, and were hurrying him off in triumph; and tho' two of his officers reſcued him at the expence of their own lives, he received ſeveral dangerous wounds before he could break looſe. Above 60 Spaniards periſhed in the rout; and what rendered the diſaſter more afflicting, 40 of theſe fell alive into the hands of an enemy never known to ſhew mercy to a captive.

131
Cortes repulſed in an attack.

The approach of night, though it delivered the dejected Spaniards from the attacks of the enemy, uſhered in, what was hardly leſs grievous, the noiſe of their barbarous triumph, and of the horrid feſtival with which they celebrated their victory. Every quarter of the city was illuminated; the great temple ſhone with ſuch peculiar ſplendor, that the Spaniards could plainly ſee the people in motion, and the prieſts buſy in haſtening the preparations for the death of the priſoners. Through the gloom they fancied that they diſcerned their companions by the whiteneſs of their ſkins, as they were ſtripped naked and compelled to dance before the image of the god to whom they were to be offered. They heard the ſhrieks of thoſe who were ſacrificed, and thought they could diſtinguiſh each unhappy victim by the well-known ſound of his voice. Imagination added to what they really ſaw or heard, and augmented its horror. The moſt unfeeling melted into tears of compaſſion, and the ſtouteſt heart trembled at the dreadful ſpectacle which they beheld.

Cortes, who, beſides all that he felt in common with his ſoldiers, was oppreſſed with the additional load of anxious reflections natural to a general on ſuch an unexpected calamity, could not, like them, relieve his mind by giving vent to its anguiſh. He was obliged to aſſume an air of tranquillity in order to revive the ſpirits

132
The Mexicans renew the attack with great fury.

and hopes of his followers. The juncture, indeed, required an extraordinary exertion of fortitude. The Mexicans, elated with their victory, ſallied out next morning to attack him in his quarters. But they did not rely on the efforts of their own arms alone; they ſent the heads of the Spaniards whom they had ſacrificed to the leading men in the adjacent provinces, and aſſured them that the god of war appeaſed by the blood of their invaders, which had been ſhed ſo plentifully on his altars, had declared with an audible voice, that in eight days time thoſe hated enemies ſhould be finally deſtroyed, and peace and proſperity re-eſtabliſhed in the empire.

A prediction, uttered with ſuch confidence, and in terms ſo void of ambiguity, gained univerſal credit among a people prone to ſuperſtition. The zeal of the provinces which had already declared againſt the Spaniards augmented, and ſeveral which had hitherto remained inactive took arms with enthuſiaſtic ardour to execute the decrees of the gods. The Indian auxiliaries who had joined Cortes, accuſtomed to venerate the ſame deities with the Mexicans, and to receive the reſponſes of their prieſts with the ſame implicit faith, abandoned the Spaniards as a race of men devoted to certain deſtruction. Even the fidelity of the Tlaſcalans was ſhaken, and the Spaniſh troops were left almoſt alone in their ſtations. Cortes, finding that he attempted in vain to diſpel the ſuperſtitious fears of his confederates by argument, took advantage, from the imprudence of thoſe who had framed the prophecy in fixing its accompliſhment ſo near at hand, to give them a ſtriking demonſtration of its falſity. He ſuſpended all military operations during the period marked out by the oracle. Under cover of the brigantines, which kept the army at a diſtance, his troops lay in ſafety and the fatal term expired without any diſaſter.

133
Cortes adopts a more cautious mode of proceeding.

His allies, aſhamed of their own credulity, returned to their ſtation. Other tribes, judging that the gods, who had now deceived the Mexicans, had decreed finally to withdraw their protection from them, joined his ſtandard; and ſuch was the levity of a ſimple people, moved by every ſlight impreſſion, that, in a ſhort time after ſuch a general defection of his confederates, Cortes ſaw himſelf, if we may believe his own account, at the head of 150,000 Indians. Even with ſuch a numerous army, he found it neceſſary to adopt a new and more wary ſyſtem of operation. Inſtead of renewing his attempts to become maſter of the city at once, by ſuch bold but dangerous efforts of valour as he had already tried, he made his advances gradually, and with every poſſible precaution againſt expoſing his men to any calamity ſimilar to that which they ſtill bewailed. As the Spaniards puſhed forward, the Indians regularly repaired the cauſeways behind them. As ſoon as they got poſſeſſion of any part of the town the houſes were inſtantly levelled with the ground. Day by day, the Mexicans, forced to retire as their enemies gained ground, were hemmed in within more narrow limits. Guatimozin, though unable to ſtop the career of the enemy, continued to defend his capital with obſtinate reſolution, and diſputed every inch of ground. But the Spaniards, having not only varied their mode of attack, but, by order of Cortes, having changed the weapons with which they fought, were again armed with the long Chinantlan ſpears, which they had employed with ſuch ſucceſs againſt Narvaez; and, by the firm array in which this enabled them to range themſelves, they repelled, with little danger, the looſe aſſault of the Mexicans: incredible numbers of them fell in the conflicts, which they renewed every day. While war waſted without, famine began to conſume them within the city. The Spaniſh brigantines, having the entire command of the lake, rendered it impoſſible to receive any ſupply of proviſions by water. The vaſt number of his Indian auxiliaries enabled Cortes to ſhut up the avenues, to the city by land. The ſtores which Guatimozin had laid up were exhauſted by the multitudes which crowded into the capital to defend their ſovereign and the temples of their gods. Not only the people, but perſons of the higheſt rank, felt the utmoſt diſtreſſes of want What they ſuffered brought on infectious and mortal diſtempers, the laſt calamity that viſits beſieged cities, and which filled up the meaſure of their woes.

134
Guatimozin refuſes to ſubmit on any terms.

But, under the preſſure of ſo many and ſuch various evils, the ſpirit of Guatimozin remained firm and unſubdued. He rejected with ſcorn every overture of peace from Cortes; and, diſdaining the idea of ſubmitting to the oppreſſors of his country, determined not to ſurvive its ruin. The Spaniards continued their progreſs. At length all the three diviſions penetrated into the great ſquare in the centre of the city, and made a ſecure lodgment there. Three-fourths of the city were now reduced, and laid in ruins. The remaining quarter was ſo cloſely preſſed, that it could not long withſtand aſſailants who attacked it from their new ſtation with ſuperior advantage, and more aſſured expectation of ſucceſs. The Mexican nobles, ſolicitous to ſave the life of a monarch whom they revered, prevailed on Guatimozin to retire from a place where reſiſtance was now vain, that he might rouſe the more diſtant provinces of the empire to arms, and maintain there a more ſucceſsful ſtruggle with the public enemy. In order to facilitate the execution of this meaſure, they endeavoured to amuſe Cortes with overtures of ſubmiſſion, that while his attention was employed in adjuſting the articles of pacification, Guatimozin might eſcape unperceived. But they made this attempt upon a leader of greater ſagacity and diſcernment than to be deceived by their arts. Cortes ſuſpecting their intention, and aware of what moment it was to defeat it, appointed Sandoval, the officer on whoſe vigilance he could moſt perfectly rely, to take the command of the brigantines, with ſtrict injunctions to watch every motion of the enemy. Sandoval, attentive to the charge, obſerving ſome large canoes crowded with people rowing along the lake with extraordinary rapidity, inſtantly gave the ſignal to chace. Gracia Holguin, who commanded the fleeteſt brigantine, ſoon overtook them, and was preparing to fire on the foremoſt canoe, which ſeemed to carry ſome perſon whom all the reſt followed and obeyed. At once the rowers dropt their oars, and all on board, throwing down their arms, conjured him with cries and tears to forbear, as the emperor was there. Holguin eagerly ſeized his prize; and Guatimozin, with a dignified compoſure, gave himſelf up into his hands, requeſting only that no inſult might be offered to the empreſs or his children. When conducted to Cortes, he

135
He is taken priſoner.

he appeared neither with the ſullen ſierceneſs of a barbarian, nor with the dejection of a ſupplicant. “I have done,” ſaid he, addreſſing himſelf to the Spaniſh general, “what became a monarch. I have defended my people to the laſt extremity. Nothing now remains but to die. Take this dagger,” laying his hand on one which Cortes wore, “plant it in my breaſt, and put an end to a liſe which can no longer be of uſe.”

136 Mexico ſubmits.

As ſoon as the fate of their ſovereign was known, the reſiſtance of the Mexicans ceaſed; and Cortes took poſſeſſion of that ſmall part of the capital which yet remained undeſtroyed. Thus terminated the ſiege of Mexico, the moſt memorable event in the conqueſt of America. It continued 75 days, hardly one of which paſſed without ſome extraordinary effort of one party in the attack, or of the other in the defence of a city, on the fate of which both knew that the fortune of the empire depended. As the ſtruggle here was more obſtinate, it was likewiſe more equal, than any between the inhabitants of the Old and New Worlds. The great abilities of Guatimozin, the number of his troops, the peculiar ſituation of his capital, ſo far counterbalanced the ſuperiority of the Spaniards in arms and diſcipline, that they muſt have relinquiſhed the enterpriſe, if they had truſted for ſucceſs to themſelves alone. But Mexico was overturned by the jealouſy of neighbours who dreaded its power, and by the revolt of ſubjects impatient to ſhake off its yoke. By their effectual aid, Cortes was enabled to accompliſh what, without ſuch ſupport, he would hardly have ventured to attempt. How much ſoever this account of the reduction of Mexico may detract, on the one hand, from the marvellous relations of ſome Spaniſh writers, by aſcribing that to ſimple and obvious cauſes which they attribute to the romantic valour of their countrymen, it adds, on the other, to the merit and abilities of Cortes, who under every diſadvantage, acquired ſuch an aſcendant over unknown nations, as to render them inſtruments towards carrying his ſcheme into execution.

The exultation of the Spaniards, on accompliſhing this arduous enterpriſe, was at firſt exceſſive. But this was quickly damped by the cruel diſappointment of thoſe ſanguine hopes which had animated them amidſt ſo many hardſhips and dangers. Inſtead of the inexhauſtible wealth which they expected from becoming maſters of Montezuma's treaſures, and the ornaments of ſo many temples, their rapaciouſneſs could collect only an inconſiderable booty amidſt ruins and deſolation (A). Guatimozin, aware of his impending fate, had ordered what remained of the riches amaſſed by his anceſtors to be thrown into the lake. The Indian auxiliaries, while the Spaniards were engaged in conflict with the enemy, had carried off the moſt valuable part of the ſpoil. The ſum to be divided among the conquerors was ſo ſmall, that many of them diſdained to accept of the pittance which fell to their ſhare, and all murmured and exclaimed; ſome againſt Cortes and his confidents, whom they ſuſpected of having ſecretly appropriated to their own uſe a large portion of the riches which ſhould have been brought into the common ſtock; others againſt Guatimozin, whom they accuſed of obſtinacy, in refuſing to diſcover the place where he had hidden his treaſure.

Arguments, intreaties, and promiſes, were employed in order to ſoothe them; but with ſo little effect, that Cortes, from ſolicitude to check this growing ſpirit of diſcontent, gave way to a deed which ſtained the glory of all his great actions.

137 Guatimozin tortured.

Without regarding the former dignity of Guatimozin, or feeling any reverence for thoſe virtues which he had diſplayed, he ſubjected the unhappy monarch, together with his chief favourite, to torture, in order to force from them a diſcovery of the royal treaſures, which it was ſuppoſed they had concealed. Guatimozin bore whatever the refined cruelty of his tormentors could inflict, with the invincible fortitude of an American warrior. His fellow-ſufferer, overcome by the violence of the anguiſh, turned a dejected eye towards his maſter, which ſeemed to implore his permiſſion to reveal all that he knew. But the high-ſpirited prince, darting on him a look of authority mingled with ſcorn, checked his weakneſs, by aſking, “Am I now repoſing on a bed of flowers?” Overawed by a reproach, he perſevered in his dutiful ſilence, and expired. Cortes, aſhamed of a ſcene ſo horrid, reſcued the royal victim from the hands of his tortures, and prolonged a liſe reſerved for new indignities and ſufferings.

138 The Spaniards become maſters of the whole Mexican empire.

The fate of the capital, as both parties had foreſeen, decided that of the empire. The provinces ſubmitted one after another to the conquerors. Small detachments of Spaniards marching through them without interruption, penetrated, in different quarters, to the great Southern Ocean, which, according to the ideas of Columbus, they imagined would open a ſhort as well as eaſy paſſage to the Eaſt Indies, and ſecure to the crown of Caſtile all the envied wealth of thoſe fertile regions; and the active mind of Cortes began already to form ſchemes for attempting this important diſcovery. In his after ſchemes, however, he was diſappointed; but Mexico hath ever ſince remained in the hands of the Spaniards.

139 Ancient diviſions of Mexico.

The *ancient* kingdom of Mexico, properly ſo called, was divided into ſeveral provinces, of which the vale of Mexico was the fineſt in every reſpect. It is ſurrounded by verdant mountains, meaſuring upwards of 120 miles in circumference at their baſe. A great part of this vale is occupied by two lakes, the upper one of freſh water, but the lower one brackiſh, communicating with the former by means of a canal. All the water running from the mountains is collected in this lower lake, on account of its being in the bottom of the valley; hence it was ready, when ſwelled by extraordinary rains, to overflow the city of Mexico, as has already been obſerved. This delightful region contained the three imperial cities of Mexico, Acolhuacan, and Tlacopan; beſides 40 others, with innumerable villages and hamlets; but the moſt conſiderable of theſe, according to Clavigero, now ſcarcely retain one-twentieth part of their former magnificence. The principal inland provinces to the northward were

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(A) The gold and ſilver, according to Cortes, amounted only to 120,000 peſos, Relat. 280, A, a ſum far inferior to that which the Spaniards had formerly divided in Mexico.

the Otomies; to the ſouth-weſt the Malatzincas and Cuitlatecas; to the ſouth the Tlahuicas and Cohuixcas; to the ſouth-eaſt, after the ſtates of Itzocan, Jauhtepec, Quauhquecollon, Atlixco, Tehuacan, and others, where the great provinces of the Mixtecas, the Zapotecas, and the Chiapanecas; towards the eaſt were the provinces of Tepayacac, the Popolocas, and Totonacas. The maritime provinces on the Mexican Gulf were Coatzacualco and Cuetlachtlan, called by the Spaniards *Cotaſta*. On the pacific Ocean were thoſe of Coliman, Zacatollan, Tototepec, Tecuantepec, and Zoconochco.

The province of the Otomies began in the northern part of the vale of Mexico, extending through the mountains to the north to the diſtance of 90 miles from the city of Mexico; the principal cities being Tollon or Tula, and Xilotepec: the latter made the capital of the country by the Spaniards. Beyond the ſettlements of the Otomies, the country for more than a thouſand miles in extent was inhabited only by barbarous and wandering ſavages.

The Malatzinca province contained the valley of Tolocan, and all the country from *Taximaroa* to the frontier of the kingdom of Michuacan. The valley of Tolocan is upwards of 40 miles long from ſouth-eaſt to north-weſt, and 30 in breadth where broadeſt. Its principal city, named alſo *Tolocan*, is ſituated at the foot of a high mountain covered with ſnow, 30 miles diſtant from Mexico.

The country of the Cuitlatecas extended from north-eaſt to ſouthweſt, upwards of 200 miles, extending as far as the Pacific Ocean. Their capital was named Mexcaltepec, once a great and populous city, ſituated upon the ſea-coaſt; but of which the ruins are now ſcarcely viſible. That of the Tlahuicas was named Quauhnahuac, and ſituated about 40 miles to the ſouthward of Mexico. The province extended almoſt 60 miles ſouthward, commencing from the ſouthern mountains of the vale of Mexico.

The country of the Cohuixcas extended on the ſouthward as far as the Pacific Ocean, through that part where at preſent the port and city of Acapulco lie. It was divided into the ſtates of Tzompanco, Chilapan, Tlapan, and Tiſtla; the latter a very hot and unwholeſome country. To this province belonged a place named *Tlacho*, celebrated for its ſilver-mines.

The province of the Mixtecas extended from *Acatlan*, a place diſtant about 120 miles from Mexico, as far as the Pacific Ocean towards the ſouth-eaſt. The inhabitants carried on a conſiderable commerce, and had ſeveral well inhabited cities and villages. To the eaſt of the Mixtecas were the Zapotecas, ſo called from their capital Teotzapotlan. In their diſtrict was the valley of Huaxyacac, now Oaxaca or Guaxaca.

The province of Mazatlan lay to the northward of the Mixtecas; and to the northward and eaſtward of the Zapotecas was *Chimantla*, having their capitals of the ſame name with their provinces. The Chiapanecas, Zoqui, and Queleni, were the laſt of the Mexican provinces towards the ſouth-eaſt. On the ſide of the mountain Popocatepec and around it lay ſeveral ſtates, of which the moſt conſiderable were Cholallan and Huexotzinco. Thoſe two having, with the aſſiſtance of the Tlaſcalans, ſhaken off the Mexican yoke, re-eſtabliſhed their former ariſtocratical government. The Cholulans poſſeſſed a ſmall hamlet called Cuitlaxcoapan, in the place where the Spaniards afterwards founded the city of Angelopoli, which is the ſecond of New Spain.

To the eaſtward of Cholula lay a conſiderable ſtate named Tepayacac; and beyond that the Popolocas, whoſe principal cities were Tecamachalco and Quecholac. To the ſouthward of the Popolocas was the ſtate of Tahuacan, bordering upon the country of the Mixtecas; to the eaſt, the maritime province of Cuetlachtlan; and to the north the Totonacas. The extent of this province was 150 miles, beginning from the frontier of Zacatlan, a ſtate diſtant about 80 miles from the court, and terminating in the Gulf of Mexico. Beſides the capital, named *Mizquihuacan*, this country had the beautiful city of Chempoallan, ſituated on the coaſt of the Gulf; remarkable for being that by which the Spaniards entered the Mexican empire.

Coliman was the moſt northerly of the provinces on the Pacific Ocean; the capital, named alſo Coliman, being in lat. 19. long. 272. Towards the ſouth-eaſt was the province of Zacotlan, with its capital of the ſame name; then came the coaſt of the Cuitlatecas; after it that of the Cohuixcans, in which was the celebrated port of Acapulco. The *Jopi* bordered on the Cohuixca coaſt; and adjoining to that the Mixteca country, now called *Xicayan;* next to that was the large province of Tecuantepec; and laſtly, that of Xochonochco.

This province, the moſt ſoutherly of the Mexican empire, was bounded on the eaſt and ſouth-eaſt by the country of Xochitepec, which did not belong to Mexico; on the weſt by Tecuantepec; and on the ſouth by the ocean. The capital, called alſo *Xoconochco*, was ſituated between two rivers, in 14 degrees of latitude and 283 of longitude. On the Mexican Gulph there were, beſides the country of the Totonecas, the provinces of Cuetlachtlan and Coatzacualco; the latter bounded on the eaſt by the ſtates of Tabaſco and the peninſula of Yucatan. The province of Cuetlachtlan comprehended all the coaſt between the rivers Alvarado and Antigua, where the province of the Totonecas began.

140 Climate.

The climate of this vaſt country varies very much according to the ſituation of its different parts. The maritime places are hot, unhealthy, and moiſt; the heat being ſo great as to cauſe people ſweat even in the month of January. This heat is ſuppoſed to be owing to the flatneſs of the coaſts, and the accumulation of ſand upon them. The moiſture ariſes from the vaſt evaporation from the ſea, as well as from the great torrents of water deſcending from the mountains. The lands which lie in the neighbourhood of high mountains, the tops of which are always covered with ſnow, muſt of neceſſity be cold; and Clavigero informs us, that he has been on a mountain not more than 25 miles diſtant from the city of Mexico, where there was white froſt and ice even in the dog-days. "All the other inland countries (ſays our author), where the greateſt population prevailed, enjoys a climate ſo mild and benign, that they neither feel the rigour of winter nor the heats of ſummer. It is true, in many of theſe countries, there is frequently white froſt

Mexico.

in the three months of December, January, and February, and ſometimes even it ſnows; but the ſmall inconvenience which ſuch cold occaſions continues only till the riſing ſun; no other fire than his rays is neceſſary to give warmth in winter; no other relief is wanted in the ſeaſon of heat but the ſhade: the ſame clothing which covers men in the dog-days defends them in January, and the animals ſleep all the year under the ſky.

141 Cauſes of mildneſs of the climate.

"This mildneſs and agreeableneſs of climate under the torrid zone is the effect of ſeveral natural cauſes entirely unknown to the ancients, who did not believe it to be inhabited; and not well underſtood by ſome moderns, by whom it is believed unfavourable to thoſe who live in it. The purity of the atmoſphere, the ſmaller obliquity of the ſolar rays, and the longer ſtay of this luminary above the horizon in winter, in compariſon of other regions farther removed from the equator, concur to leſſen the cold, and to prevent all that horror which disfigures the face of nature in other climes. During that ſeaſon a ſerene ſky and the natural delights of the country are enjoyed; whereas, under the frigid, and even for the moſt part under the temperate zones, the clouds rob man of the proſpect of heaven, and the ſnow buries the beautiful productions of the earth. No leſs cauſes combine to temper the heat of ſummer. The plentiful ſhowers which frequently water the earth after mid-day from April or May to September or October; the high mountains, continually loaded with ſnow, ſcattered here and there through the country of Anahuac; the cool winds which breathe from them in that ſeaſon; and the ſhorter ſtay of the ſun above the horizon, compared with the circumſtances of the temperate zone, transform the climes of thoſe happy countries into a cool and cheerful ſpring. But the agreeableneſs of the climate is counterbalanced by thunder-ſtorms, which are frequent in ſummer particularly in the neighbourhood of the mountain of Tlaſcala; and by earthquakes, which are at all times felt, though with leſs danger than terror. Storms of hail are neither more frequent nor more ſevere than in Europe."

142 Mexican volcanoes.

One undoubted inconvenience which Mexico has is that of volcanoes, of which our author enumerates five. One named by the Spaniards *Volcan d'Orizaba* is higher than the peak of Teneriffe, according to the account of the Jeſuit Tallandier, who meaſured them both. It began to ſend forth ſmoke in the year 1545, and continued burning for 20 years, but has not diſcovered any ſymptoms of eruption ſince that time. It is of a conical figure; and by reaſon of its great height, may be ſeen at 50 leagues diſtance. The top is always covered with ſnow, but the lower part with woods of pine and other valuable timber. It is about 90 miles to the eaſtward of the capital.

Two other mountains, named *Popocatopec* and *Iztaccihuatl*, which lie near each other, at the diſtance of 33 miles to the ſouth-eaſt of Mexico, are likewiſe ſurpriſingly high. Clavigero ſuppoſes the former to be higher than the higheſt of the Alps, conſidering the elevated ground on which the baſe of it ſtands. It has a crater more than half a mile wide: from which, in the time of the Mexican kings, great quantities of ſmoke and flame iſſued. In the laſt century it frequently threw out great ſhowers of aſhes upon the adjacent places; but in this century hardly any ſmoke has been obſerved. This mountain is named by the Spaniards *Volcan*, and the other *Sierra Nevada*. The latter has alſo ſometimes emitted flames. Both of them have their tops always covered with ſnow in ſuch quantities, that the maſſes which fall down upon the neighbouring rocks ſupply the cities of Mexico, Gelopoli, Cholula, and all the adjacent country to the diſtance of 40 miles, with that commodity; of which the conſumpt is ſo great, that in 1746 the impoſt upon what was conſumed in the city of Mexico amounted to 15,222 Mexican crowns; ſome years after it amounted to 20,000; and is now in all probability a great deal more. Beſides theſe, there are the two mountains of Coliman and Tochtlan, both of which have occaſionally emitted flames. Our author does not include in the liſt of Mexican volcanoes either thoſe of Nicaragua or Guatimala; becauſe theſe countries were not ſubject to the Mexican ſovereigns. Thoſe of Guatimala ſometimes break forth in a moſt furious manner, and in the year 1773 entirely deſtroyed that beautiful city. The Nicaraguan volcano called *Juruyo* was only a ſmall hill before the year 1760. In that year, however, on the 29th of September, it began to burn with furious exploſions, ruining entirely the ſugar-work and the neighbouring village of *Guacana*; and from that time continued to emit fire and burning rocks in ſuch quantities, that the erupted matters in ſix years had formed themſelves into three high mountains nearly ſix miles in circumference. During the time of the firſt eruption, the aſhes were carried as far as the city of Queretaro, 150 miles diſtant from the volcano; and at Valladolid, diſtant 60 miles from it, the ſhower was ſo abundant, that the people were obliged to ſweep the houſe-yards two or three times a-day.

Beſides theſe volcanoes, there are others in Mexico of a very remarkable height. The great chain of mountains called the *Andes* are continued through the iſthmus of Panama and through all Mexico, until they are loſt in the unknown mountains of the north. The moſt conſiderable of that chain is known in Mexico, by the name of *Sierra Madre* particularly in Cinaloa and Tarahumara, provinces no leſs than 1200 miles diſtant from the capital.

143 Rivers and lakes.

Mexico is well watered by very conſiderable rivers though none of them are comparable to thoſe of South America. Some of thoſe run into the gulf of Mexico and others into the pacific Ocean. The Alvarado has its principal ſource among the mountains of the Zapotecas, and diſcharges itſelf by three navigable mouths into the Mexican gulf, at the diſtance of 30 miles from Vera Cruz. The Coatzocualco riſes among the mountains of the Mixtecas, and empties itſelf into the gulf near the country of Onohualco. The river Chiapan, which likewiſe runs into this gulf, riſes among the mountains which ſeparate the diſtrict of Chiapan from that of Guatimala. The Spaniards call this river *Tabaſco*; by which name they alſo called that tract of land which unites Yucatan to the Mexican continent. It was alſo called the *Grigalva*, from the name of the commander of the firſt Spaniſh fleet who diſcovered it.

The moſt celebrated of the rivers which run into the Pacific Ocean is that called by the Spaniards

[illegible]

Gaudalaxara or *Great river*. It riſes in the mountains of Toloccan; and after running a courſe of more than 600 miles, diſcharges itſelf into the ocean in 22° latitude.

There are likewiſe in this country ſeveral lakes of very conſiderable magnitude: but thoſe of Nicaragua, Chapalian, and Pazquaro, which are of the greateſt extent, did not belong to the ancient Mexican empire. The moſt remarkable were theſe in the vale of Mexico, upon which the capital of the empire was founded. Of theſe, the freſh water one called the *lake of Chalco*, extended in length from eaſt to weſt 12 miles, as far as the city of Xochimileo; from thence, taking a northerly direction, it incorporated itſelf by means of a canal with the lake of Tezcuco; but its breadth did not exceed ſix miles. The other, named the *lake of Tezcuco*, extended 15, or rather 17, miles from eaſt to weſt, and ſomething more from ſouth to north; but its extent is now much leſs, by reaſon of the Spaniards having diverted the courſe of many of the ſtreams which run into it. This lake is ſalt, which Clavigero ſuppoſes to ariſe from the nature of the ſoil which forms its bed.

Beſides theſe, there are a number of ſmaller lakes, ſome of which are very delightful. There is a vaſt variety of mineral waters, of the nitrous, ſulphureous, and aluminous kinds, ſome of them ſo hot that meat might be boiled in them. At Tetuhuacan is a kind of petrefying water, as well as in ſeveral other parts of the empire. One of them forms a kind of ſmooth white ſtones not diſpleaſing to the taſte; the ſcrapings of which taken in broth are celebrated as a diaphoretic, probably without any good reaſon. The doſe for a perſon not difficult to be ſweated is one drachm of the ſcrapings. Many of the rivers of Mexico afford ſurpriſing and beautiful caſcades; particularly the great river Guadalaxara, at a place called *Tempizque*, 15 miles to the ſouthward of that city. Along a deep river called *Atoyaque* is a natural bridge conſiſting of a vaſt mound of earth, along which carriages paſs conveniently. Clavigero ſuppoſes it to have been the fragment of a mountain thrown down by an earthquake, and then penetrated by the river.

144 Metals and minerals.

The mineral productions of Mexico are very valuable. The natives found gold in ſeveral provinces of the empire. They gathered it principally from among the ſands of their rivers in grains; and the people in whoſe country it was found, were obliged to pay a certain quantity by way of tribute to the emperor. They dug ſilver out of mines in Tlochco, and ſome other countries but it was leſs prized by them than by other nations. Since the conqueſts however, ſo many ſilver mines have been diſcovered in that country, eſpecially in the provinces to the northweſt of the capital, that it is in vain to attempt any enumeration of them. They had two ſorts of copper; one hard, which ſerved them inſtead of iron, to make axes and other inſtruments for war and agriculture; the other kind, which was ſoft and flexible, ſerved for domeſtic utenſils as with us. They had alſo tin from the mines of Tlachco, and dug lead out of mines in the country of the Otomies; but we are not informed what uſes they put this laſt metal to. They had likewiſe mines of iron in Tlaſcala, Tlacho, and ſome other places; but theſe were either unknown to the Mexicans, or they did not know how to benefit themſelves by them. In Chilapan were mines of quickſilver; and in many places they had ſulphur, alum vitriol, cinnabar ochre, and an earth greatly reſembling white lead. Theſe minerals were employed in painting and dyeing: but we know not to what uſe they put their quickſilver. There was great abundance of amber and aſphaltum upon their coaſts; both of which were paid in tribute to the king of Mexico from many parts of the empire. The former was wont to be ſet in gold by way of ornament, and aſphaltum was employed in their ſacrifices.

145 Precious ſtones.

Mexico produces ſome diamonds, though but few in number; but they had in greater plenty ſome other precious ſtones, ſuch as amethyſts, cats-eyes, turquoiſes, cornelians, and ſome green ſtones reſembling emeralds, and very little inferior to them; of all which a tribute was paid to the emperor by the people in whoſe territories they were found. They were likewiſe furniſhed with cryſtal in plenty from the mountains which lay on the coaſt of the Mexican gulph, between the port of Vera Cruz and the river Coatzacualco. In the mountains of Celpolalpan, to the eaſtward of Mexico, were quarries of jaſper and marble of different colours: they had likewiſe alabaſter at a place called *Tecalco*, now *Tecale*, in the neighbourhood of the province of Tapeyacac and many other parts of the empire. The ſtone tetzontli is generally of a dark red colour, pretty hard, porous and light, and unites moſt firmly with lime and ſand; on which account it is of great requeſt for buildings in the capital, where the foundation is bad. There are entire mountains of loadſtone, a very conſiderable one of which lies between Teoitztlan and Chilapan, in the country of the Cohuixcas. They formed curious figures of nephritic ſtone, ſome of which are ſtill preſerved in European muſeums. They had a kind of fine white talc which burnt into an excellent plaſter, and with which they uſed to whiten their paintings. But the moſt uſeful ſtone they had was that called *itztli*, of which there is great abundance in many parts of Mexico. It has a gloſſy appearance, is generally of a black colour, and ſemitranſparent; though ſometimes alſo of a blue or white colour. In South America this ſtone is called *pietra delgalinazzo*; and Count Caylus endeavours to ſhow, in a manuſcript diſſertation quoted by Bomare, that the *obſidiona*, of which the ancients made their *vaſes murini*, were entirely ſimilar to this ſtone. The Mexicans made of it looking-glaſſes, knives, lancets, razors, and ſpears. Sacred vaſes alſo were made of it after the introduction of Chriſtianity.

146 Vegetable productions.

The ſoil of Mexico, though various, produced every where the neceſſaries and even the luxuries of life. "The celebrated Dr Hernandez, the Pliny of New Spain (ſays Clavigero), has deſcribed in his Natural Hiſtory about 1200 plants natives of the country; but this deſcription, though large being confined to medicinal plants, has only compriſed one part of what provident nature has produced there for the benefit of mortals. With regard to the other claſſes of vegetables, ſome are eſteemed for their flowers, ſome for their fruit, ſome for their leaves, ſome for their root, ſome for their trunk or their wood; and others for their gum, reſin, oil, or juice."

147 Flowers and fruits. Mexico abounds with a great variety of flowers, many of which are peculiar to the country, while multitudes of others imported from Europe and Aſia rival in luxuriance the natives of the country itſelf. The fruits are partly natives of the Canary iſlands, partly of Spain, beſides thoſe which grow naturally in the country. The exotics are water-melons, apples, pears, peaches, quinces, apricots, pomegranates, figs, black cherries, walnuts, almonds, olives, cheſnuts, and grapes; though theſe laſt are likewiſe natives. There are two kinds of wild vine found in the country of the Mixtecas; the one reſembling the common vine in the ſhoots and figure of its leaves. It produces large red grapes covered with an hard ſkin, but of ſweet and grateful taſte, which would undoubtedly improve greatly by culture. The grape of the other kind is hard, large, and of a very harſh taſte, but they make an excellent conſerve of it. Our author is of opinion that the cocoa tree, plantain, citron, orange, and lemon, came from the Philippine iſlands and Canaries; but it is certain that theſe, as well as other trees, thrive in this country as well as in their native ſoil. All the maritime countries abound with cocoa-nut trees; they have ſeven kinds of oranges and four of lemons, and there are likewiſe four kinds of plantains. The largeſt, called the *zapalat*, is from 15 to 20 inches long, and about three in diameter; it is hard, little eſteemed, and only eat when roaſted or boiled. The *platano largo*, or "long plantain," is about eight inches long and one and a half in diameter: the ſkin is at firſt green, and blackiſh when perfectly ripe. The *guinco* is a ſmaller fruit, but richer, ſofter, and more delicious, though not ſo wholeſome. A ſpecies of plantain, called the *dominico*, is ſmaller and more delicate than the others. There are whole woods of plantain trees, oranges, and lemons; and the people of Michuacan carry on a conſiderable commerce with the dried plantains, which are preferable either to raiſins or figs. Clavigero enumerates 28 different ſorts of fruit natives of Mexico, beſides many others, the names of which are not mentioned. Hernandez mentions four kinds of cocoa nuts; of which the ſmalleſt of the whole was in moſt uſe for chocolate and other drinks daily made uſe of; the other kinds ſerved rather for money in commerce than for aliment. The cocoa was one of the plants moſt cultivated in the warm countries of the empire; and many provinces paid it in tribute to the emperor, particularly that of Xeconocho, the cocoa nut of which is preferable to the others. Cotton was one of the moſt valuable productions of the country as it ſerved inſtead of flax; though this laſt alſo was produced in the country. It is of two kinds, white and tawny-coloured. They made uſe of *rocou* or Braſil-wood in their dying, as the Europeans alſo do. They made cordage of the bark, and the wood was made uſe of to produce fire by friction.

148 Grain. The principal grain of Mexico, before the introduction of theſe from Europe, was maize, in the Mexican language called *tluolli*; of which there were ſeveral kinds, differing in ſize, weight, colour, and taſte. This kind of grain was brought from America to Spain, and from Spain to the other countries of Europe. The French bean was the principal kind of pulſe in uſe among them, of which there were more ſpecies than of the maize. The largeſt was called *ayacotli*, of the ſize of a common bean, with a beautiful red flower; but the moſt eſteemed was the ſmall black, heavy, French bean. This kind of pulſe, which is not good in Italy, is in Mexico ſo excellent, that it not only ſerves for ſuſtenance to the poorer claſs of people, but is eſteemed a luxury even by the Spaniſh nobility.

149 Eſculent roots. Of the eſculent roots of Mexico, the following were the moſt remarkable. 1. The *xicama*, called by the Mexicans *catzotl*, was of the figure and ſize of an onion; ſolid, freſh, juicy, and of a white colour; it was always eat raw. 2. The *camote*, is another very common in the country, of which there are three ſorts, white, yellow, and purple: they eat beſt when boiled. 3. The *caccmite* is the root of a plant which has a beautiful flower called the *tyger-flower*, with three red pointed petals, the middle part mixed with white and yellow, ſomewhat reſembling the ſpots of the creature whence it takes its name. 4. The *huacamote*, is the root of a kind of Caſſava plant, and is likewiſe boiled. 5. The *papa*, a root tranſplanted into Europe, and greatly valued in Ireland, was brought from South America into Mexico. Beſides all which they have a number of kitchen vegetables imported from the Canaries, Spain, and other countries of Europe. The American aloe is very ſimilar to the real one, and is a plant of which the Mexicans formerly, and the Spaniards ſtill, make great uſe.

150 Trees. They have a variety of palm-trees. From the fibres of the leaves of one ſpecies they make thread. The bark of another kind, to the depth of three fingers, is a maſs of membranes, of which the poor people make mats. The leaves of another kind are uſed for ornaments in their feſtivals. They are round, groſs, white, and ſhining; having the appearance of ſhells heaped upon one another. A fourth kind bears nuts called *cocoas*, or nuts of oil. Theſe nuts are of the ſize of a nutmeg, having in the inſide a white, oily, eatable kernel, covered by a thin, purple pellicle. The oil has a ſweet ſcent, but is eaſily condenſed, when it becomes a ſoft maſs, as white as ſnow.

Of timber trees there are a great variety, of a quality not inferior to any in the world; and as there are a variety of climates in the country, every one produces a kind of wood peculiar to itſelf. There are whole woods of cedars and ebonies, vaſt quantities of algalochum or wood of aloes; beſides others valuable on account of their weight, durability, and hardneſs; or for their being eaſily cut, pliable, of a fine colour, or an agreeable flavour. There are alſo in Mexico innumerable trees remarkable for their ſize. Acoſta mentions a cedar, the trunk of which was 16 fathoms in circumference; and Clavigero mentions one of the length of 107 Paris feet. In the city of Mexico he mentions very large tables of cedar made out of ſingle planks. In the valley of Atlixco is a very ancient fir-tree, hollowed by lightning; the cavity of which could conveniently hold fourteen horſemen; nay, we are informed by the archbiſhop of Toledo, that, in 1770, he went to view it along with the archbiſhop of Guatimala, at which time he cauſed an hundred young lads enter its cavity. Our author mentions ſome other trees, of the ſpecies called *ceibas*, which for magnitude may be compared with this celebrated fir. "The largeneſs of theſe trees (ſays he) is proportioned to their prodigious elevation; and they afford a moſt delightful proſpect at the time they are adorned with new leaves and loaded with fruit, in which there is incloſed a particular ſpecies of fine, white, and moſt delicate cotton. This might be, and actually has been, made into webs as ſoft, delicate, and perhaps more ſo than ſilk; but it is toilſome to ſpin, on account of the ſmallneſs of the threads, and the profit does not requite the labour, the web not being laſting. Some uſe it for pillows and matraſſes, which have the ſingular property of expanding enormouſly when expoſed to the heat of the ſun. De Bomare ſays, that the Africans make of the thread of the ceiba that vegetable taffety which is ſo ſcarce, and ſo much eſteemed in Europe. The ſcarcity of ſuch cloth is not to be wondered at conſidering the difficulty of making it. The ceiba, according to this author, is higher than all other trees yet known."

Clavigero mentions a Mexican tree, the wood of which is very valuable, but poiſonous, and if incautiouſly handled, when freſh cut, produces a ſwelling in the ſcrotum. Our author has forgot the name given to it by the Mexicans; nor has he ever ſeen the tree itſelf, nor been witneſs to the effect.

151
Medicinal and aromatic gums.

This country abounds alſo with aromatic and medicinal trees, producing gums, reſins, &c. From one of theſe a balſam is produced not in the leaſt inferior to the celebrated balſam of Mecca. It is of a reddiſh black or yellowiſh white, of a ſharp bitter taſte, and of a ſtrong but moſt grateful odour. It is common in the provinces of Panuco and Chiapan, and other warm countries. The kings of Mexico cauſed it to be tranſplanted into their celebrated garden of Huaxtepec, where it flouriſhed, and was afterwards multiplied in all the neighbouring mountains. The Indians, in order to procure a greater quantity of this balſam, burn the branches, which affords more than mere diſtillation though undoubtedly of an inferior quality; nor do they regard the loſs of the trees, which are very abundant. The ancient Mexicans were wont to extract it alſo by decoction. The firſt parcel of this balſam brought from Mexico to Rome was ſold at one hundred ducats per ounce; and was, by the apoſtolic ſee, declared to be matter fit for chriſm; though different from that of Mecca, as Acoſta and all other writers on this ſubject obſerve. An oil is likewiſe drawn from the fruit of this tree, ſimilar in taſte and ſmell to that of the bitter almond, but more acrimonious. From two other trees named the *huaconex* and *maripenda*, an oil was extracted equivalent to the balſam. The former is a tree of a moderate height; the wood of which is aromatic, and ſo hard, that it will keep freſh for ſeveral years, though buried under the earth. The leaves are ſmall and yellow; the flowers likewiſe ſmall and white, and the fruit ſimilar to that of the laurel. The oil was diſtilled from the bark of the tree, after breaking it, and keeping it three days in ſpring-water, and then drying it in the ſun. The leaves likewiſe afforded an agreeable oil by diſtillation. The Maripenda is a ſhrub with lanceolated leaves the fruit of a red colour when ripe, and reſembling the grape. The oil is extracted by boiling the branches with a mixture of ſome of the fruit.

The tree producing liquid amber, the liquid ſtorax of the Mexicans, is of a large ſize, the leaves ſimilar to thoſe of the maple, indented, white in one part and dark in the other, diſpoſed of in threes; the fruit is thorny and round, but polygonous, with the ſurface and the angles yellow; the bark of the tree partly green and partly tawny. By inciſions in the trunk they extract that valuable ſubſtance named *liquid amber*, and the oil of the ſame name, which is ſtill more valuable. Liquid amber is likewiſe obtained from a decoction of the branches, but it is inferior to that obtained from the trunk.

The name *copalli* in Mexico is generic, and common to all the reſins; but eſpecially ſignifies thoſe made uſe of for incenſe. There are ten ſpecies of theſe trees yielding reſins of this kind; the principal of which is that from which the Copal is got, ſo well known in medicine and varniſhes. A great quantity of this was made uſe of by the ancient Mexicans, and is ſtill uſed for ſimilar purpoſes by the Spaniards. The *tecopalli* or *tepecopalli* is a reſin ſimilar to the incenſe of Arabia; which diſtils from a tree of moderate ſize that grows in the mountains, having a fruit like an acorn, and containing the nut inveloped in a mucilage, within which there is a ſmall kernel uſeful in medicine.

The *mizquitl*, or mezquite, is a ſpecies of true acacia, and the gum diſtilling from it is ſaid to be the true gum arabic. It is a thorny ſhrub, with branches irregularly diſpoſed, the leaves ſmall, thin, and pinnated; the flowers being like thoſe of the birch-tree.—The fruits are ſweet and eatable, containing a ſeed of which the barbarous Chichemecas were wont to make a kind of paſte that ſerved them for bread. The wood is exceedingly hard and heavy, and the trees are as common in Mexico as oaks are in Europe, particularly on hills in the temperate countries.

Of the elaſtic gum, which is found in plenty in Mexico, the natives were in uſe to make foot-balls, which, though heavy, have a better ſpring than thoſe filled with air. At preſent they varniſh with it their hats, cloaks, boots, and great coats, in a manner ſimilar to what is done in Europe with wax; and by which means they are rendered all water-proof.

152
Mexican animals.

Our author laments that the natural hiſtory of vegetables in Mexico is very little known, and that of animals no better. The firſt Spaniards (ſays he) who gave them names, were more ſkilful in the art of war than in the ſtudy of nature. Inſtead of retaining the terms which would have been moſt proper, they denominated many animals tygers, wolves, bears dogs, ſquirrels &c. although they were very different in kind, merely from ſome reſemblance in the colour of their ſkin, their figure, or ſome ſimilarity in habits and diſpoſition. The quadrupeds found in Mexico at the arrival of the Spaniards, were lions, tygers, wild cats, bears, wolves, foxes, the common ſtags, white ſtags, bucks, wild goats, badgers, pole-cats, weaſles, martins, ſquirrels, polatucas, rabbits hares, otters, and rats. All theſe animals are ſuppoſed by our author to be common to both continents. The white ſtag, whether it be the ſame ſpecies of the other or not, is undoubtedly common to both, and was known to the Greeks and Romans. The Mexicans call it the *king of the ſtags*. M. Buffon imagines the

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white colour of this creature to be the effect of captivity; but Clavigero ſays, that it is found wild, and of the ſame white colour, on the mountains of New Spain. In many other points, he alſo controverts the opinions of this celebrated naturaliſt, who will not allow the lion, tyger, or rabbit, to be natives of America. "The *miztli* of the Mexicans (ſays he) is no other than the lion without hair mentioned by Pliny, and totally diſtinct from the African lion; and the *ocelotl* is no way different from the African tyger, according to the teſtimony of Hernandez, who knew both the one and the other. The *tochtli* of Mexico is exactly the rabbit of the old continent; and at leaſt as ancient as the Mexican calender, in which the figure of the rabbit was the firſt ſymbolical character of their years. The wild cats, in ſize much larger than the domeſtic cats, are fierce and dangerous; the bears are all black, and more corpulent than thoſe which are brought from the Alps into Italy. The hares are diſtinguiſhed from thoſe of Europe by their longer ears, and the wolves by a groſſer head. According to M. Buffon, the Mexicans give the name of *polutaca* to the quimicpaltan, or flying rat of the Mexicans. We call it rat, becauſe it reſembles a rat in the head, though it is much larger, and flying; becauſe in its natural ſtate, the ſkin of its ſides is looſe and wrinkled, which it diſtends and expands together with its feet like wings, when it makes any conſiderable leap from one tree to another. This is confounded with the common ſquirrel on account of their likeneſs, but they are undoubtedly different. Mice were brought to Mexico in European ſhips; the rats were not ſo, but known in the country by the name of *quimichin*, a word metaphorically applied to ſpies."

Our author now proceeds to enumerate the quadrupeds common to New Spain with the reſt of the continent of America. Among theſe he will not allow a place to the Peruvian ſheep, the *huanaco*, and ſloth; all of which are peculiar to South America. Hernandez indeed makes mention of the Peruvian ſheep, and gives a drawing of it; but this was only on account of a few individuals brought thence from Peru, which the Mexicans called by that name, in the ſame manner as he deſcribes ſeveral animals of the Philippine iſles; not that they had ever been bred in Mexico, or found in any country of North America, unleſs it was ſome individual carried there, as they are carried as a curioſity to Europe. The animals which he allows to be common to both countries are, the Mexican hog, the moufete, the opoſſum, the armadillo, the *techichi*, a ſmall animal reſembling a dog; which being perfectly dumb, gave occaſion to a report that the Mexican dogs could not bark. The fleſh of this animal was eat by them, and was eſteemed agreeable and nouriſhing food. After the conqueſt of Mexico, the Spaniards having neither large cattle nor ſheep, provided their markets with this quadruped; by which means, the ſpecies ſoon came to be extinct, though it had been very numerous. The land-ſquirrel is very numerous in the kingdom of Michuacan, has great elegance of form, and is extremely graceful in its movement; but it cannot be tamed, and bites moſt furiouſly every perſon who approaches it.

Beſides theſe, there are ſea-lions, rattoons, and that voracious animal named the *tapir*. Oviedo informs us that he has ſeen it at one bite tear off two or three hand-breadths of ſkin from a hound, and, at another a whole leg and thigh. The fleſh is eatable, and its ſkin is valued on account of its being ſufficiently ſtrong to reſiſt muſket-balls. There are likewiſe great numbers of monkeys of many different kinds; ſome of which have heads reſembling thoſe of dogs. Some of them are ſtrong and fierce, equalling a man in ſtature when they ſtand upright.

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Deſcription of ſome animals peculiar to Mexico.

Among the animals peculiar to Mexico, is one named by our author *coyoto*, which appears to have been inaccurately deſcribed by other natural hiſtorians; ſome making it one ſpecies and ſome another. He ſays it has the voracity of a wolf, the cunning of a fox, the form of a dog, and in ſome properties reſembles the *adive* and *chacal*. It is about the ſize of a maſtiff, but more ſlender. The eyes are yellow and ſparkling, ears ſmall, pointed, and erect; the ſnout blackiſh, ſtrong limbs, and the feet armed with large crooked nails. The tail is thick and hairy, the ſkin a mixture of black, brown, and white; and the voice is compounded of the howl of the wolf and the bark of the dog. It is one of the moſt common quadrupeds in Mexico, and moſt deſtructive to the flocks. When it invades a ſheep fold, if it cannot find a lamb to carry off, it ſeizes a ſheep by the neck with its teeth, and coupling with it, and beating it on the rump with its tail, conducts it whither it pleaſes. It purſues the deer, and will ſometimes even attack men. Its uſual pace is a trot, but ſo quick that a horſe at the gallop can ſcarce overtake it. The *tlalcoyotl* or *tlalcoyoto* is about the ſize of a middling dog, and in our author's opinion is the largeſt animal that lives under the earth. Its head has ſome reſemblance to that of a cat; but in colour and length of hair it reſembles the lion.—It has a long thick tail, and feeds upon poultry and ſmall animals, which it catches in the night-time. The *tepeizuintli*, or mountain-dog, though it is but of the ſize of a ſmall dog, is ſo bold that it attacks deer, and ſometimes kills them. Its hair and tail are long, the body black, but the head, neck, and breaſt, white. Mr Buffon reckons this animal the ſame with the glutton, but Clavigero denies it. Another animal, larger than the two foregoing, is called the *xoloitzcuintli*. Some of theſe are no leſs than four feet in length. It has a face like the dog, but tuſks like the wolf, with erect ears, the neck groſs, and the tail long.—It is entirely deſtitute of hair, excepting only the ſnout where there are ſome thick crooked briſtles. The whole body is covered with a ſmooth, ſoft, aſh-coloured ſkin, ſpotted partly with black and tawney. This ſpecies of animals, as well as the two former, are almoſt totally extinct. A Lyncean academician named *Giovanni Fabri*, has endeavoured to prove that the xoloitzcuintli is the ſame with the wolf of Mexico; but this is denied by our author.

An animal called *ocotochtli*, a kind of wild cat, is remarkable more for the fabulous account of it than for any ſingular property with which it is really endowed. According to Dr Hernandez, when this creature takes any prey, it covers it with leaves, and afterwards mounting on ſome neighbouring tree, it begins howling to invite other animals to eat its prey; being itſelf always the laſt to eat; becauſe the poiſon of its tongue is ſo ſtrong, that if it eat firſt, the prey would be infected, and other animals which eat of it would die.

(153) Curious kind of mole.

A curious animal of the mole kind is called *tozan* or *tuza*. It is about the ſize of an European mole, but very different otherwiſe. The body is about ſeven or eight inches long, and well made; the ſnout like that of a mouſe, the ears ſmall and round, with the tail ſhort. The mouth is armed with very ſtrong teeth, and its paws are furniſhed with ſtrong crooked nails, with which it digs its habitations in the earth. It is extremely deſtructive to the corn fields by the quantity of grain it ſteals, and to the highways by the number of holes it makes in them; for when, on account of the dimneſs of its ſight, it cannot find its firſt hole, it makes another, and ſo on. It digs the earth with its claws and two canine teeth which it has in the upper jaw. In digging, it puts the earth into two membranes like purſes, which are under its ear, and which are furniſhed with muſcles neceſſary for contraction and diſtenſion. When the membranes are full, it empties them by ſtriking the bottom with its paws, and then digs again as before. Theſe creatures are very numerous; but our author does not remember to have ſeen them in the place where land-ſqirrels inhabit.

154 Mexican birds.

The birds are ſo numerous, and of ſuch various appearances and qualities, that Mexico has been called the country of birds as Africa is of quadrupeds. Though Hernandez paſſes over a great number of ſpecies, he yet deſcribes above 200 peculiar to the country. He allows to the eagles and hawks of Mexico a ſuperiority over thoſe of Europe; and the falcons of this country were formerly eſteemed ſo excellent, that, by the deſire of Philip II. an hundred of them were ſent every year over to Spain. The largeſt, the moſt beautiful, and the moſt valuable kind of eagles, is called by the Mexicans *itzquauhtli*, and will purſue not only the larger kind of birds, but quadrupeds, and even men.

The ravens of Mexico do not, like thoſe of other countries, feed upon carrion, but ſubſiſt entirely by ſtealing corn. The carrion is devoured by the birds called in South America *gallinazzi*, in Mexico *zopilots* and *aure*. By Hernandez they are ſaid to be a ſpecies of ravens; but, according to Clavigero, they are very different, not only in their ſize but in the ſhape of their head, their flight, and their voice.—They fly ſo high, that though pretty large, they are loſt to the ſight: before a hail-ſtorm they may be ſeen wheeling in great numbers in the air, until they entirely diſappear. They diſcover carrion by the acuteneſs of their ſight and ſmell at a great height in the air, and deſcend upon it in a ſpiral flight. They are extremely numerous, and are very uſeful to the country, becauſe they not only clear the fields of carrion but attend the crocodiles, and deſtroy the eggs of theſe terrible animals. There is another bird, called by the Mexicans the *king of the zopilots*, on account as it is ſaid, that the true zopilot will not touch a bit of carrion till the other has firſt taſted it.

The aquatic birds are very numerous, and of great variety.—There are at leaſt 20 ſpecies of ducks, a vaſt number of geeſe, with ſeveral kinds of herons, great numbers of ſwans, quails, water-rails, divers, king's fiſhers, pelicans, &c. The multitude of ducks is ſometimes ſo great, that they cover the fields, and appear at a diſtance like flocks of ſheep. Some of the herons and egrets are perfectly white, ſome aſh-coloured; others have the plumage of the body white, while the neck, with the tops and upper part of the wings, and part of the tail, are enlivened with a bright ſcarlet, or beautiful blue.

155 Singular property of the pelican.

Clavigero mentions a ſingular quality of the pelican, in which it differs from all other birds hitherto known, viz. that it aſſiſts ſuch of its own ſpecies as are hurt or ſick. Of this diſpoſition the Americans ſometimes take the advantage to procure fiſh without any trouble. They take a live pelican and break its wing, and, after tying it to a tree, conceal themſelves in the neighbourhood: there they watch the coming of the other pelicans with their proviſions; and as ſoon as they ſee them throw up the fiſh from the pouch they have below their bill, they run in, and leaving a little for the captive bird carry off all the reſt. The *yoalquachilli* is a ſmall aquatic bird, with a long narrow neck, ſmall head, long yellow bill, long legs, feet, and claws, and a ſhort tail. It is remarkable for the weapons with which it is naturally provided. On the head is a little circle or coronet, of a horny ſubſtance, which is divided into three very ſharp points, and there are two others on the fore-part of the wings.

Numbers of the other claſſes of birds are valuable for their fleſh, plumage, or ſong, while ſome are remarkable for their extraordinary inſtinct or other properties. Our author enumerates more than 70 ſpecies of thoſe which afford an agreeable and wholeſome food. Beſides the common fowls which were brought from the Canaries to the Antilles, and from theſe to Mexico, there were, and ſtill are, fowls peculiar to the country itſelf. Theſe partly reſemble the common fowl and partly the peacock, whence they had the name of *gallipavos* from the Spaniards. From Mexico, they were imported into Europe, where they have multiplied very faſt, eſpecially in Italy, though the common fowls have multiplied much more in Mexico. There are three kinds of pheaſants; one of which is as large as a gooſe, and very docile. It will become ſo tame as to pick food from its maſter's hand, and run to meet him with ſigns of joy when he comes home, ſhut the door with its bill &c. By keeping in a yard along with other poultry, it learns to fight like a cock, raiſing the feathers of its creſt, as cocks do thoſe of their neck.

There are great numbers of birds valuable on account of their plumage, which was made uſe of by the Mexicans in their excellent moſaic works; an art which ſeems now to be totally loſt. Peacocks have been carried from the old continent to Mexico; but, not being attended to, have propagated very ſlowly. The birds remarkable for their ſong are likewiſe very numerous; among which that called the *centzonitl*, by Europeans the *mocking-bird*, is the moſt remarkable, on account of its counterfeiting naturally the notes of all others it hears. It has been attempted to bring it to Europe, but without ſucceſs. The cardinals are very remarkable, not only on acconnt of their fine colours, but likewiſe of their notes; and even the ſparrows have a moſt delightful and various ſong.

There are great numbers of beautiful parrots; and there is a bird which counterfeits the human voice, but in a kind of burleſque tone, and will follow travellers a great way. The *tzacua* is remarkable for its inſtinct. Birds of this kind live in ſociety, every tree being a village or city to them, having great numbers of neſts in the neighbourhood of each other, all hanging from the boughs. One of them, whoſe office it is to be the head or guard of the village, reſides in the middle of the tree; from which it flies about from one neſt to another, viſiting them all, and after ſinging a little, returns to its place, while the reſt continue perfectly ſilent. If any bird of a different ſpecies approaches the tree, he flies to it, and with his bill and wings endeavours to drive it off; but if a man or any large animal comes near, he flies ſcreaming to another tree; and if at that time any of his fellows happen to be returning to their neſts, he meets them, and, changing his note, obliges them to retire again: as ſoon as he perceives the danger over, he returns to his wonted round of viſiting the neſts.

156 Reptiles. Mexico, like all other American countries, abounds with reptiles, many of them of an enormous ſize. The crocodiles are not leſs to be dreaded than thoſe of Africa or Aſia; and there are likewiſe ſome of thoſe monſtrous ſerpents met with in the Eaſt Indies and in South America; though happily the ſpecies of thoſe terrible creatures ſeems to be nearly extinct, as they are ſeldom to be found but in ſome ſolitary wood, or other remote place. There are great numbers of lizards, ſome of which the people ſuppoſe to be poiſonous; but our author thinks this opinion ill founded. There are ſeveral kinds of poiſonous ſerpents, of which the rattle-ſnake is one. The *cenocoatl* is another poiſonous ſerpent, and remarkable for having a luminous appearance in the dark; by which, as by the rattle in the tail of the former, travellers are warned to avoid it. Among the harmleſs ſnakes is a very beautiful one about a foot in length, and of the thickneſs of the little finger. It appears to take great pleaſure in the ſociety of ants, inſomuch that it will accompany theſe inſects upon their expeditions, and return with them to their uſual neſt.—It is called both by the Mexicans and Spaniards the *mother of the ants;* but our author ſuppoſes that all the attachment which the ſnake ſhows to the ant-hills proceeds from its living on the ants themſelves. The ancient Mexicans were wont to take delight in keeping an harmleſs green ſnake which they catched in the fields, and which when well fed, would grow to the length of five or ſix feet. It was generally kept in a tub, which it never left but to receive food from the hand of its maſter; and this it would take either mounted on his ſhoulder or coiled about his legs.

157 Aquatic animals. The aquatic animals are innumerable. Clavigero mentions a ſpecies of frogs ſo large that a ſingle one will weigh a pound, and which are excellent food.—Of fiſh proper for food, our author ſays that he has counted upwards of 100 ſpecies, without taking in the turtle, crab, lobſter, or any other cruſtaceous animal. The ſharks are well known for their voracity. A whole ſheep's ſkin, and even a large butcher's knife, has been found in the belly of one of them. They are accuſtomed to follow veſſels, to devour any filth that is thrown overboard; and, according to Oviedo, they have been known to keep up with ſhips ſailing before a wind for no leſs than 500 miles. The botetto is a fiſh about eight inches in length, but exceſſively thick. While this fiſh lies alive upon the beach it ſwells whenever it is touched to an enormous ſize, and boys often take pleaſure in making it burſt with a kick. The liver is ſo poiſonous as to kill with ſtrong convulſions in half an hour after it is eaten. The occhione is a round flat fiſh, of eight or ten inches in diameter; the under part of the body being perfectly flat but the upper part convex; and in the centre, which is the higheſt part it has a ſingle eye as large as that of an ox, furniſhed with eyelids like the eyes of land animals. This eye remains open even after the fiſh is dead, and has an hideous appearance, ſo as ſometimes to ſtrike the ſpectators with horror. Campoi endeavours to prove, that this is the fiſh named by Pliny *uranoſcopos*. The Roman hiſtorian does not deſcribe this fiſh; but Clavigero obſerves, that the name of *uranoſcopos* might be equally applicable to all fiſh which have eyes upon the head that look up to the ſky, as ſkates and other flat fiſh. The axolotl is a great ugly water-lizard, remarkable for having a periodical evacuation of blood from the uterus, like the human ſpecies. It is eatable, taſtes like an eel, and the fleſh is looked upon to be good in conſumptions. There are likewiſe a vaſt variety of ſhells, ſponges, and lithophyts. Hernandez gives the figure of a ſponge ſent to him from the Pacific Ocean, which was of the ſhape of a man's hand, but with ten or more fingers; of a clay colour, with black backs and red ſtreaks, harder than the common ſponges.

158 Inſects. Of flying and other minute inſects, the number is prodigiouſly great. There are a variety of beetles: ſome of a green colour make a great noiſe in flying; on which account children are fond of them. There are great numbers of ſhining beetles, which make a delightful appearance at night, as well as the luminous flies which abound in the country. There are ſix kinds of bees and four kinds of waſps; of which laſt, one collects wax and honey of a very ſweet taſte: another is called the *wandering waſp* from its frequent changes of abode; and in conſequence of theſe changes, it is conſtantly employed in collecting materials for its habitations. There is alſo a black hornet with a red tail, the ſting of which is ſo large and ſtrong, that it will not only penetrate a ſugar-cane but even the trunk of a tree. The lake of Mexico abounds with a kind of fly, the eggs of which are depoſited upon the flags and ruſhes in ſuch quantities as to form large maſſes. Theſe are collected by the fiſhermen, and carried to market for ſale. They are eaten by both Mexicans and Spaniards, and have much the ſame taſte as the caviare of fiſh. The Mexicans eat alſo the flies themſelves ground and made up with ſalt-petre. There are abundance of gnats in the moiſt places and lakes; but the capital, though ſituated upon a lake, is entirely free from them. There are other flies which make no noiſe in their flight, but cauſe a violent itching by their bite; and if the part be ſcratched, an open wound is apt to enſue. The butterflies are in vaſt numbers, and

their wings glow with colours far ſuperior to thoſe of Europe; the figures of ſome of them are given by Hernandez. But notwithſtanding its beauties and advantages, Mexico is ſubject to the dreadful devaſtations of locuſts, which ſometimes occaſion the moſt deſtructive famines.

There are ſome of the worms of Mexico made uſe of by the inhabitants as food; others are poiſonous. There are great numbers of ſcolopendræ and ſcorpions, ſome of the former growing to an immenſe ſize. Hernandez ſays, that he has ſeen ſome of them two feet long and two inches thick. The ſcorpions are very numerous; and in the hot parts of the country their poiſon is ſo ſtrong as to kill children, and give terrible pain to adults. Their ſting is moſt dangerous during thoſe hours of the day, in which the ſun is hotteſt. In the province of Michuacan is a ſingular ſpecies of ant, larger than the common one, with a greyiſh body and black head. On its hinder part is a little bag full of a ſweet ſubſtance, of which children are very fond. The Mexicans ſuppoſe this to be a kind of honey collected by the inſect; but Clavigero thinks it rather is its eggs. There is a miſchievous kind of tick, which in the hot countries abounds among the graſs. From thence it eaſily gets upon the cloaths, and from them upon the ſkin. There it fixes with ſuch force, from the particular figure of its feet, that it can ſcarcely be got off. At firſt it ſeems nothing but a ſmall black ſpeck, but in a ſhort time enlarges to ſuch a degree, from the blood which it ſucks, that it equals the ſize of a bean, and then aſſumes a leaden colour. Oviedo ſays, that the beſt and ſafeſt method of getting ſpeedily rid of it is by anointing the part with oil, and then ſcraping it with a knife.—If it is not ſpeedily removed, a wound is made ſimilar to that which the nigera or chegoe makes. The following inſects were eaten by the ancient Mexicans; 1. The *atetepitz*, a marſh beetle, reſembling in ſhape and ſize the flying beetles, having four feet, and covered with an hard ſhell. 2. The *atopinan*, a marſh-graſshopper of a dark colour, and great ſize, being not leſs than ſix inches long and two broad. 3. The *ahuihuitla*, a worm which inhabits the Mexican lake, four inches long, and of the thickneſs of a gooſe-quill, of a tawny colour on the upper part of the body, and white upon the under part. It ſtings with its tail, which is hard and poiſonous. 4. The *ocuiliztac*, a black marſh-worm, which becomes white on being roaſted.

159
Curious zoophytes.

Among the curious productions of the animal kind to be met with in this country, Clavigero mentions a kind of zoophytes which he ſaw in the year 1751, in a houſe in the country, about ten miles from Angelopoli, towards the ſouth-eaſt. They were three or four inches long, and had four very ſlender feet, with two antennæ; but their body was nothing more than the fibres of the leaves, of the ſame ſhape, ſize, and colour with thoſe of the other leaves of the trees upon which theſe creatures were found. Gemelli deſcribes another kind of theſe zoophytes which are found in Manilla.

160
Silk and cochineal.

Mexico produces alſo ſilk-worms: and the manufacture of ſilk might be carried on to great advantage, were it not prohibited for ſome political reaſons. Beſides the common ſilk, there is another found in the woods, very white, ſoft, and ſtrong. It grows on the trees in ſeveral maritime places, particularly in dry ſeaſons. Unleſs by poor people, however, this ſilk is not turned to any uſe, partly from inattention to their intereſts, but "chiefly (ſays our author) to the obſtructions which would be thrown in the way of any one who ſhould attempt a trade of that kind. We know from Cortes's letters to Charles V. that ſilk uſed to be ſold in the Mexican markets; and ſome pictures are ſtill preſerved, done by the ancient Mexicans upon a paper made of ſilk."

Cochineal is one of the moſt valuable products of Mexico, and great care is taken to rear the inſect in different parts; but the beſt is that which comes from the province of Mizteca. Some have reckoned that more than 2500 bags of cochineal are ſent every year from Mizteca to Spain; and the trade in that article carried on by the city of Oaxaca is computed at 200,000 crowns value.

161
General deſcription of the inhabitants.

Though Mexico, as we have ſeen, was originally inhabited by a number of different nations, yet all of them reſembled each other pretty much, not only in character, but in external appearance. "They generally rather exceed (ſays our author) than fall under the middle ſize, and are well proportioned in all their limbs. They have good complexions, narrow foreheads, black eyes, clean, firm, white, and regular teeth; thick, black, coarſe, gloſſy hair; thin beards, and generally no hair upon their legs, thighs, and arms, their ſkin being of an olive colour. There is ſcarcely a nation on earth in which there are fewer perſons deformed; and it would be more difficult to find a ſingle hump-backed, lame, or ſquint-eyed man among a thouſand Mexicans, than among an hundred of any other nation. The unpleaſantneſs of their colour, the ſmallneſs of their foreheads, the thinneſs of their beards, and the coarſeneſs of their hair, are ſo far compenſated by the regularity and fine proportion of their limbs, that they can neither be called very beautiful nor the contrary, but ſeem to hold a middle place between the extremes. Their appearance neither engages nor diſguſts; but among the young women of Mexico, there are many very beautiful and fair, whoſe beauty is at the ſame time rendered more winning by the natural ſweetneſs of their manner of ſpeaking, and by the pleaſantneſs and natural modeſty of their whole behaviour. Their ſenſes are very acute, eſpecially that of ſight, which they enjoy unimpaired to the lateſt age. Their conſtitutions are ſound, and their health robuſt. They are entirely free of many diſorders which are common among the Spaniards; but of the epidemical diſeaſes to which their country is occaſionally ſubject, they are generally the victims: with them theſe diſeaſes begin, and with them they end. One never perceives in a Mexican that ſtinking breath which is occaſioned in other people by the corruption of the humours or indigeſtion. Their conſtitutions are phlegmatic; but the pituitous evacuations from their heads are very ſcanty, and they ſeldom ſpit. They become grey-headed and bald earlier than the Spaniards; and although moſt of them die of acute diſeaſes, it is not very uncommon among them to attain the age of an hundred. They are now, and ever have been, moderate in eating, but their paſſion for ſtrong liquors is carried to the greateſt exceſs. Formerly they were kept within bounds by the ſeverity of the laws; but now that theſe liquors are become ſo common, and drunkenneſs is unpuniſhed, one half of the people ſeem to have loſt their ſenſes; and this, together with the poor manner in which they live, expoſed to all the baneful impreſſions of diſeaſe, and deſtitute of the means of correcting them, is undoubtedly the principal cauſe of the havoc which is made among them by epidemical diſorders.

"Many perſons allow the Mexicans to poſſeſs a great talent of imitation, but deny them that of invention; a vulgar error, which is contradicted by the ancient hiſtory of that people. Their minds are affected by the ſame variety of paſſions with thoſe of other nations, but not to an equal degree. The Mexicans ſeldom exhibit theſe tranſports of anger, or frenzies of love, which are ſo common in other countries. They are ſlow in their motions; and ſhow a wonderful tenacity and ſteadineſs in thoſe works which require time and long continued attention. They are moſt patient of injury and hardſhip; and where they ſuſpect no evil intention, are moſt grateful for any kindneſs ſhown: but ſome Spaniards, who cannot diſtinguiſh patience from inſenſibility, nor diſtruſt from ingratitude, ſay proverbially, that the Indians are alike inſenſible to injuries or benefits. That habitual diſtruſt which they entertain of all who are not of their nation prompts them often to lie and betray; ſo that good faith certainly has not been reſpected among them ſo much as it deſerves. They are by nature taciturn, ſerious, and auſtere; and ſhow more anxiety to puniſh crimes than to reward virtues.

"Generoſity and perfect diſintereſtedneſs are the principal features of their character. Gold with the Mexicans has not that value which it enjoys elſewhere. They ſeem to give without reluctance what has coſt them the utmoſt labour to acquire. The neglect of ſelfiſh intereſts, with the diſlike which they bear to their rulers, and conſequently their averſion to perform the taſks impoſed by them, ſeem to have been the only grounds of that much exaggerated indolence with which the Americans have been charged; and, after all, there is no ſet of people in that country who labour more, or whoſe labour is more neceſſary. The reſpect paid by the young people to the old, and by children to their parents, ſeem to be feelings that are born with them. Parents are very fond of their children; but the affection which huſbands bear to their wives is certainly leſs than that which wives bear to their huſbands; and it is very common for the men to love their neighbours wives better than their own.

Courage and cowardice ſeem alternately ſo to affect their minds, that it is often difficult to determine whether the one or the other predominates. They meet dangers with intrepidity, when they proceed from natural cauſes, but are eaſily terrified by the ſtern look of a Spaniard. That ſtupid indifference about death and eternity, which many authors have thought inherent in the character of every American, is peculiar only to thoſe who are yet ſo rude and uninformed as to have no idea of a future ſtate."

Thus much with reſpect to the general character of the Mexicans: but our author obſerves, that "the modern Mexicans are not in all reſpects ſimilar to the ancient, as the Greeks of theſe days have little reſemblance to thoſe who lived in the times of Plato and Pericles. The ancient Mexicans ſhowed more fire, and were more ſenſible to the impreſſions of honour. They were more intrepid, more nimble, more active, more induſtrious; but they were at the ſame time more ſuperſtitious and cruel."

162 Of the Toltecas and Chichemecas.

The Toltecas, who firſt inhabited Mexico, were accounted much more poliſhed than thoſe who came after them, inſomuch that in after ages it was cuſtomary to diſtinguiſh people of ingenuity and learning by the name of Toltecas. They always lived in ſociety, collected into cities, under the government of kings, and had regular laws. They were more addicted to the arts of peace than of war; and it was to them that the ſucceeding nations owned themſelves indebted for their knowledge of the culture of grain, cotton, pepper, &c. They underſtood the art of caſting gold and ſilver, and melting them in whatever forms they pleaſed, acquiring alſo great reputation from their ſkill in cutting gems of all kinds; and they were beſides well verſed in the ſciences of aſtronomy and chronology.

According to the ancient hiſtories of theſe people, they obſerved, about an hundred years before the Chriſtian era, how far the ſolar year exceeded the civil one; ſupplying the defect, as we do, by the addition of a day once in four years. In the year 660, while their monarchy continued in Tula, a celebrated aſtronomer, named Huematzin, aſſembled with the king's conſent all the wiſe men of the nation; and, with their aſſiſtance, painted a famous book named *Teoamoxtli*, or "divide book," in which were repreſented, in very plain figures, the origin of the Indians, their diſperſion after the confuſion of tongues of Babel, their journey in Aſia, their firſt ſettlements in America, the founding of the kingdom of Tula, and their progreſs till that time: but theſe, and other accounts of their great knowledge and accuracy, ſavour too much of exaggeration, or perhaps invention, from both which it is impoſſible to clear the Spaniards when ſpeaking of American affairs.

163 Their progreſs in agriculture.

The Chichemecas derived their knowledge of agriculture from the Toltecas, and of conſequence the Mexicans alſo. Being deſtitute of ploughs or animals of ſufficient ſtrength to aſſiſt them in their labour, they made uſe of an inſtrument of hard copper, which they called *coatl* or *coa*, but differing in ſhape either from a ſpade or mattock. They uſed copper axes to cut trees, the figure of which was the ſame with ours; only that they put the ax into the eye of the handle, inſtead of putting the handle into the eye of the ax as we do. They had ſeveral other inſtruments of agriculture, but the forms of them are not mentioned by hiſtorians. They watered their fields by means of the rivers and ſmall torrents which came from the mountains; raiſing dams to collect them, and forming canals to conduct them properly to the places which required moiſture. They uſed incloſures of ſtone, as well as hedges for the fields, uſing for their hedges the aloe plant, which is well calculated for the purpoſe; and what preparations were neceſſary they gave in December. They dibbled their maize: a method of ſowing more ſlow indeed than the ordinary one, but which certainly repays the trouble by a vaſtly larger crop, as well as by ſaving a very conſiderable quantity of ſeed. Cloſe to the newly-ſown fields they commonly erected a ſmall tower of wood, where a man kept watch, in order to drive away the birds that came to feed upon the grain; a cuſtom ſtill preſerved among the Spaniards.

164
Magnificent gardens.

In the cultivation of their gardens, the Mexicans were extremely ſkilful and magnificent; planting in them not only kitchen herbs, but fruit-trees, medicinal herbs, and flowers, with great taſte and regularity. Some of the royal gardens excited the admiration of the Spaniards ſo much, that Cortes, in a letter to Charles V. informed him that the garden at Huaxtepec was the moſt extenſive, the moſt beautiful, and moſt delightful, that had ever been beheld. It was ſix miles in circumference, and watered by a beautiful river which croſſed it; and there were pleaſure-houſes erected at proper diſtances from one another. It was for many years preſerved by the Spaniards.——The plants moſt cultivated, next to maize, were cotton, cacao, and aloe; which laſt ſerved a great many uſeful purpoſes. See Aloe.

165
Tame animals.

Though they had not the advantage of the larger quadrupeds, as horſes, oxen, or ſheep, they bred up an immenſe number of quadrupeds unknown in Europe. Private perſons brought up the ſmall quadrupeds already mentioned, reſembling little dogs; as well as turkeys, quails, geeſe, ducks, and other kinds of fowl. In the houſes of the great men were bred fiſh, deer, rabbits, and a variety of birds; and in the royal palaces, almoſt all the ſpecies of quadrupeds and winged animals to be found in theſe kingdoms were kept, as well as a great number of aquatic animals and reptiles. According to Clavigero, Montezuma II. ſurpaſſed all the kings in the world in this kind of magnificence; and there never was a nation equal to the Mexicans in the care they took in taming animals.

166
Paintings.

Painting was an art in great requeſt among the Mexicans, and one of very great uſe; as it was only by means of paintings that they recorded their hiſtories. This art they derived, like others, from the Toltecas. Some of theſe paintings were mere images of their gods, kings, heroes, or of terreſtrial objects. Others were hiſtorical, containing an account of particular events; others mythological, of which a volume is preſerved in the great library of the order of Bologna: others were codes of laws, civil and religious; while ſome were chronological, aſtronomical, or aſtrological; in which was repreſented their calendar, the poſition of the ſtars, changes of the moon, eclipſes, and prognoſtications and variations of the weather. Great numbers of theſe were burned by the ſuperſtitious Spaniards, who imagined that they contained ſome emblems of heathen worſhip. They had likewiſe geographical paintings, which ſerved not only to ſhew the extent and boundaries of their poſſeſſions, but likewiſe the ſituation of places, the direction of the coaſts, and the courſe of the rivers. In his firſt letter to Cha. V. Cortes ſays, that having made inquiries if there was any ſecure harbour for veſſels on the Mexican coaſt, Montezuma preſented him with a painting of the whole coaſt, from the port of Vera Cruz, at that time called *Chalchiuhuecan*, to the river Coatzacualco. Another author informs us alſo, that Cortes, in a long and difficult voyage which he made to the bay of Honduras, made uſe of a chart preſented to him by the lords of Coatzacualco, in which all the places and rivers were marked from the coaſt of Coatzacualco to Huejacallan.

As every thing relating to the Mexican empire was thus delineated in painting, the artiſts were innumerable: and had the numerous paintings been preſerved, we might by means of them have had a complete hiſtory of Mexico; but vaſt numbers were deſtroyed by the ſuperſtitious zeal of the Spaniards. The chief ſchool of painting was in Tezcuco: and of the paintings made there they collected ſuch a maſs, that it reſembled a little mountain; and to all theſe they ſet fire at once, to the inexpreſſible grief of the Indians, and even of themſelves, when they came to know their error: for they were compelled afterwards to attempt to remedy the evil, by collecting all the paintings that could be found throughout the empire, and to obtain what information they could from the mouths of the Indians. But though they recovered many, theſe were ſtill not ſufficient; for, from that time forward, the poſſeſſors of paintings became ſo jealous, that they concealed them from the Spaniards with the utmoſt care; and it was in a manner impoſſible to make them part with a ſingle piece.

The cloth on which theſe paintings were done was made of the thread of the aloe or a kind of palm; or they painted on ſheeps ſkins or upon paper. This laſt was made of the leaves of a certain kind of aloe, ſteeped like hemp, and afterwards waſhed, ſtretched, and ſmoothed. They uſed alſo the bark of other trees, prepared with gum; but we are ignorant of the method they uſed in the manufacture. This paper is ſimilar in thickneſs to the European paſteboard, but ſofter, ſmoother, and more eaſy for writing. In general it was made up in very long ſheets, which they preſerved in rolls, or folded like bed-ſkreens. The volume of Mexican paintings preſerved in the library of Bologna, is a thick ſkin, ill dreſſed, compoſed of different pieces painted all over, and folded up in that manner. The beautiful colours which they employed both in their paintings and in their dyes, were obtained from wood, leaves, and the flowers of different plants, as well as from various animal ſubſtances. Their white was made from a kind of ſtone which burns into a fine plaſter; or from a mineral, which after being made into a paſte worked like clay, and formed into ſmall balls, turns white in the fire like Spaniſh white. Their *black* was got from another mineral, which has a diſagreeable ſmell, or from the ſoot of a kind of pine collected in ſmall earthen veſſels. They obtained *blue* and *azure* colours from indigo; but their mode of obtaining theſe was very different from that uſed by the moderns. They put the branches of the plant into hot, or rather lukewarm, water: and after having ſtirred them about for a ſufficient time with a ſtick or laddle, they paſſed the water, when impregnated with the dye, into certain pots or cups in which they let it remain until the ſolid part of the dye was depoſited; after which they poured off the water. This ſediment was firſt dried in the ſun, and afterwards put between two plates before a fire until it grew hard. They had another plant which likewiſe afforded a blue colour, but inferior to the indigo. *Red* was obtained from the ſeeds of the achiot or rocou, and *purple* from cochineal. Their *yellows* were ochre, and a colour extracted from the beautiful flower of a plant reſembling artemiſia. With nitre theſe flowers afforded a fine orange colour; and by means of alum they extracted other colours.

167
They did not uſe hieroglyphics or characters.

168
Careful to preſerve their traditions.

The Mexican painters were by no means arrived at much perfection in the knowledge of light and ſhade or of deſign; nevertheleſs, in ſome of the ancient paintings particularly in the portraits of the kings the proportions were exactly obſerved. But this was by no means the caſe in their common paintings: though this is aſcribed by Clavigero, not to the want of ſkill in theſe painters, but to the haſte with which the figures were executed, and of which the Spaniards were witneſſes. Beſides paintings however, the Mexicans are ſaid to have employed hieroglyphics and characters: but this is abſolutely denied by our author; who tells us, that "they repreſented material things by their proper figures; but in order to ſave labour, paper, and colours, they contented themſelves with repreſenting part of an object, which was ſufficient to make it underſtood. But as we cannot underſtand the writings of others till we have learned to read them, in like manner thoſe American authors, who ſay that Mexicans make uſe of characters, required to have been firſt inſtructed in the Mexican manner of repreſenting objects, in order to have been able to underſtand the paintings which ſerved them in place of writing. When they would repreſent any perſon, they painted a man, or a human head, and over it a figure expreſſing the meaning of his name, as appears in the figures of the Mexican kings. To expreſs a city or village, they painted in like manner a figure which ſignified the ſame thing, with its name. To form their hiſtories or annals, they painted on the margin of the cloth or paper the figures of the years in ſo many ſquares, and at the ſide of each ſquare the event or events which happened that year; and if, on account of the number of years, the hiſtory of which they meant to relate, they could not all be contained in one canvas, they were continued on another. With reſpect to the order of repreſenting the years and events, it was at the liberty of the hiſtorian to begin at which ever angle of the piece he pleaſed; but at the ſame time conſtantly obſerving, that if the painting began at the upper angle or the right-hand, he proceeded towards the left; but if it began, as it moſt commonly did, at the upper angle of the left hand he proceeded ſtraight downwards. If he painted the firſt year at the lower angle of the left, he continued towards the right; but if he began at the lower angle of the right, he painted ſtraight upwards; ſo that on the upper part of his canvas he never painted from left to right, nor ever on the lower part from right to left; never advanced upwards from the left, nor downwards from the right. When this method of the Mexicans is underſtood, it is eaſy to diſcover at firſt ſight which is the beginning and which the ending of any hiſtorical painting. Their paintings, however, ought not to be conſidered as a regular full hiſtory, but only as monuments and aids of tradition. We cannot expreſs too ſtrongly the care which parents and maſters took to inſtruct their children and pupils in the hiſtory of the nation. They made them learn ſpeeches and diſcourſes which they could not expreſs by the pencil; they put the events of their hiſtory into verſe, and taught them to ſing them. This tradition diſpelled the doubts and undid the ambiguity which paintings alone might have occaſioned: and, by the aſſiſtance of thoſe monuments, perpetuated the memory of their heroes and of virtuous examples; their mythology, rites, laws, and cuſtoms.

169
Preſerved the memory of events by knotted threads.

"Nor did that people only make uſe of tradition, painting, and ſongs, to preſerve the memory of events but alſo of threads of different colours and differently knotted. This curious method of the repreſentation of things, however much uſed in Peru, does not appear to have been employed in the province of Anahuac, if not in the moſt early ages; for no traces of ſuch monuments are now to be found. Boturini ſays, that after the moſt diligent ſearch, he with difficulty found one in a place in Tlaſcula, the threads of which were already waſted and conſumed by time. If thoſe who peopled South America ever paſſed the country of Anahuac, they poſſibly might have left there this art, which was afterwards abandoned for that of painting; introduced by the Toltecans or ſome other nation ſtill more ancient."

170
Their knowledge in ſculpture,

171
Excelled in the art of caſting metals.

The Mexicans arrived at greater perfection in ſculpture, caſting of metals, and moſaic works, than in painting. Sculpture was likewiſe one of the arts exercifed by the ancient Toltecans; but the Mexicans had ſculptors among them when they left their native country of Atztlan. Several of the Toltecan ſtatues, however, were preſerved till the time of the conqueſt, particularly that of the idol Tlaloc, placed upon the mountain of the ſame name, and ſome gigantic ſtatues in one of their temples. Stone and wood were the uſual materials of their ſtatues; the former was worked with a chiſſel made of flint; and, in ſpite of the unfitneſs of the inſtrument, ſuch was the phlegmatic nature of the people, that they ſurmounted every difficulty ariſing from the tedíouſneſs of the work. In their ſtatues they learned to expreſs all the attitudes and poſtures of which the human body is capable. They obſerved the proportions exactly, and could when neceſſary execute the moſt delicate ſtrokes with the chiſſel. They not only made entire ſtatues, but cut out in wood and in ſtone figures in baſſo relievo; of which kind are thoſe of Montezuma II. and one of his ſons, recorded with praiſes by Acoſta. They alſo made ſtatues of clay and wood, employing for theſe a chiſſel of copper. The number of their ſtatues was in proportion to that of their idols; but ſo active were the Spaniſh prieſts in deſtroying theſe, that there is now ſcarce any veſtige of them remaining. The foundation of the firſt church in Mexico was laid with idols; on which occaſions many thouſand ſtatues of their gods were neceſſarily broke in peices. In caſting of metals however, the Mexicans greatly excelled their works either of painting or ſculpture. "The miracles they produced of this kind (ſays Clavigero), would not be credible, if, beſides the teſtimony of thoſe who ſaw them, a great number of curioſities of this kind had not been ſent from Mexico to Europe. The works of gold and ſilver ſent in preſent from the conqueror Cortes to Charles V. filled the goldſmiths of Europe with aſtoniſhment; who, as ſeveral authors of that period atteſt, declared that they were altogether inimitable. The Mexican founders made both of gold and ſilver the moſt perfect images of natural bodies. They made a fiſh in this manner, which had its ſcales alternately one of ſilver and the other of gold; a parrot with a moveable head, tongue, and wings; and an ape with a moveable head and feet, having a ſpindle in its hand in the attitude of ſpinning. They ſet gems in gold and ſilver, and made moſt curious jewellery of great value. In ſhort, theſe ſort of works were ſo admirably finiſhed, that even the Spaniſh ſoldiers, all ſtrong with the ſame wretched thirſt for gold, valued the workmanſhip above the materials. This wonderful art, formerly practiſed by the Toltecas, the invention of which they aſcribed to one of their gods, has been entirely loſt by the debaſement of the Indians, and the indolent neglect of the Spaniards. We are doubtful if there are any remains of thoſe curious works; at leaſt we apprehend that it would be more eaſy to find them in ſome of the cabinets of Europe than in all New Spain. Covetouſneſs to profit by the materials muſt unqueſtionably have conquered all deſire to preſerve them as curioſities." The works of the Mexicans in gold and ſilver, executed with the hammer, were much inferior to thoſe of the Europeans.

172 Beautiful moſaic, But of all the works executed by the ancient Mexicans, thoſe of moſaic were the moſt curious as well as moſt highly valued by themſelves. Theſe were made of the feathers of birds; and for procuring them they reared a great number of thoſe birds of fine plumage, with which the country abounded, not only in the royal palaces, but alſo in private houſes; and at certain ſeaſons they carried off the feathers for theſe purpoſes, or to ſell them at market. They valued particularly the feathers of the humming birds, on account of their ſmallneſs, fineneſs, and various colours; and in theſe, as well as other birds of fine plumage, nature ſupplied them not only with all the colours producible by art, but likewiſe with many which art cannot imitate. Their moſaic works, as well as indeed all others of the Mexicans, required infinite patience. At the undertaking of every work of this kind ſeveral artiſts aſſembled; and having agreed upon a deſign, and fixed their meaſures and proportions, each artiſt charged himſelf with the execution of a certain part of the image, and exerted himſelf ſo diligently in it, that he frequently ſpent a whole day in adjuſting a feather; firſt trying one and then another, viewing it ſometimes one way, then another, until he found one which gave his part that ideal perfection propoſed to be attained. When the part which each artiſt undertook was done, they aſſembled again to form the entire image from them. If any part happened to be in the leaſt deranged, it was wrought again until it was perfectly finiſhed. They laid hold of the feathers with ſmall pincers, that they might not do them the leaſt injury, and paſted them on the cloth with ſome glutinous matter; then they united all the parts upon a little table or a plate of copper, and flattened them ſoftly until they left the ſurface of the image ſo equal and ſmooth, that it appeared to be the work of a pencil. Theſe works were prodigiouſly admired by the Spaniards "It is wonderful (ſays Acoſta) how it was poſſible with the feathers of birds to execute works ſo fine and ſo equal, that they appear the performance of the pencil; and what neither the pencil nor the colours in painting can effect, they have, when viewed from a ſide, an appearance ſo beautiful, ſo lively, and ſo animated, that they give delight to the ſight. Some Indians, who are able artiſts, copy whatever is painted with a pencil ſo exactly with plumage, that they rival the beſt painters of Spain." The laſt artiſt in this admirable kind of work lived lately in Pazcuaro, the capital of Michuacan; but it is moſt probable that the art either has already died or will die with him. A beautiful kind of moſaic was likewiſe done with broken ſhells; and this is ſtill carried on in Guatimala. There were many other artiſts who formed figures in imitation of the moſaic works with flowers and leaves upon mats, which were made uſe of at feſtivals; and theſe were eagerly ſought after by the Spaniſh nobility, on account of their ſingular beauty. Others imitated with ſilk the figures done with feathers; but theſe laſt were always greatly ſuperior.

173 Their architecture. The Mexicans were ſkilled in architecture even before they left their native country; and many edifices ſtill remain which were conſtructed by them during their frequent journies from one place to another. At their firſt arrival on the lake, they had no other materials to build their houſes with but reeds and mud, until the ſucceſs of their commerce allowed them to purchaſe better materials. When the city came to its perfection, the houſes of the principal people were conſtructed of ſtone and lime; they conſiſted of two floors, having halls, large court-yards, and chambers fitly diſpoſed; the roofs were flat and terraced; the walls ſo well whitened, poliſhed, and ſhining, that they appeared to the Spaniards when at a diſtance to have been conſtructed of ſilver. The floor was paved with plaſter, perfectly level, plain, and ſmooth. Many of their houſes were crowded with battlemets and turrets; and their gardens had fiſh-ponds, and the walks of them ſymmetrically laid out. The large houſes had in general two entrances, the principal one to the ſtreet, the other to the canal: they had no wooden doors to their houſes, but covered the entrance with ſmall reeds, from whence they ſuſpended a ſtring of cocoa ſhells, or ſome other materials which would make a noiſe, ſo as to awake the attention of the family when any perſon lifted up the reeds to enter the houſe. —The houſes of the poorer ſort were conſtructed of reeds, unburnt bricks, ſtone, or mud; and the roofs made of a kind of long hay which grows plentifully in the fields, particularly in the warm parts of the country. For this purpoſe they uſed alſo the leaves of the aloe placed in the manner of tiles, to which they bear ſome reſemblance both in thickneſs and ſhape. Out of the columns or ſupports of theſe houſes was generally a tree in the vigour of its growth; by which means, beſides the pleaſure derived from its foliage and ſhade, they ſaved themſelves ſome labour and expence. Theſe houſes had one or more apartments according to the circumſtances of the family.

Our author is of opinion that the ancient Mexicans, underſtood the method of conſtructing arches or vaults, as appears, he ſays, from ſome remains of their buildings as well as from their paintings. They had likewiſe cornices and other ornaments of architecture. They had alſo ſquare or cylindrical columns; but it is not known whether theſe had any capitals or not. They frequently adorned them with figures in *baſſo relievo*;

relievo; but their great ambition was to have them all made out of one ſtone. The foundations of the large houſes in the capital were laid upon beams of cedar driven into the ground, on account of its want of ſolidity; and the ſame method is ſtill practiſed by the Spaniards. The roofs of theſe were made of cedar, fir, cypreſs, pine, &c. In the royal palaces the columns were of marble or even of alabaſter, which the Spaniards miſtook for jaſper. In the reign of Ahuizotl a new kind of ſtone, named *tetzontli*, was diſcovered in the Mexican lake, which was ever afterwards made uſe of for building. It is hard, light, and porous like a ſponge; by which means the lime adheres very firmly to it. It is valued likewiſe on account of its colour, which is a blood red. Some of the pavements were chequered with marble and other valuable ſtones.

174 Remarkable aqueducts. The moſt remarkable pieces of Mexican architecture, however were their aqueducts. There were two which conveyed the water to the capital from the diſtance of two miles. Theſe were conſtructed of ſtone and cement five feet high, and two paces broad upon a road for that purpoſe upon the lake; by which the water was brought to the entrance of the city, from whence it was ſent forth in ſmaller channels to ſupply the different fountains. The famous aqueduct of Chempoallan, which was done in the 16th century, is worthy of being ranked among the greateſt in Europe. The conductor of this work was a Franciſcan miſſionary named *Tembleque*; and it was executed with great ſkill by the Chempoalleſe. The water was brought from a great diſtance, and the country through which it muſt paſs was mountainous and rocky; but every difficulty was overcome by the induſtry of the Mexicans. The aqueduct, including all the turnings and windings, exceeded 30 miles in length. The principal difficulty conſiſted in croſſing three great precipices, over which they were obliged to conſtruct three bridges, the firſt of 47, the ſecond of 13, and the third of 67 arches. The largeſt arch was 100 feet high, and 61 broad; ſo that a large veſſel could have paſſed under it. It muſt however, be obſerved, that in executing this undertaking, the Mexicans were undoubtedly aſſiſted by European tools, and the directions of European workmen; ſo that we cannot with ſtrict propriety call it one of their works.

Though the ancient Mexicans never uſed any inſtruments of iron in their works, they nevertheleſs executed beautiful engravings by means of tools made of flint ſtone. They wrought alſo marble, jaſper, alabaſter, itztli, and other valuable ſtones. Of itztli they made their looking glaſſes, which were ſometimes ſet in gold, the ſharp pieces which were ſet in their ſwords, and razors to ſhave with. Theſe laſt were made with ſuch expedition, that an artiſt could finiſh upwards of *an hundred* in an hour.

175 Excellent jewellers. They were, as has already been obſerved, expert jewellers, and underſtood the art of cutting and poliſhing the ſtones, as well as of ſetting them. The gems moſt common in their country were the emeralds, amethyſts, cornelians, turquoiſes, and others unknown in Europe. Emeralds were ſo common, that no lord or noble wanted them; and none of them died without having one fixed to his lip, that it might ſerve him, as they imagined, in the other world, inſtead of a heart. When Cortes returned the firſt time to Spain, he brought with him five emeralds valued, by the jewellers there, at 100,000 ducats. The firſt was in the form of a roſe; the ſecond of an horn; the third of a little fiſh with eyes of gold; the fourth in the form of a bell, with a fine pearl for a clapper. The fifth was a ſmall cup with a foot of gold, and four little golden chains which united in a pearl in the form of a button. For this alone the Genoeſe merchants offered 40,000 ducats, in order to ſell it again to the grand ſignior. Beſides theſe, he had two emerald vaſes valued at 300,000 ducats: but theſe laſt were loſt by ſhipwreck in the unfortunate expedition of Charles V. againſt Algiers. There are no ſuch gems wrought at preſent, nor is it even known where the emerald mines are ſituated; though there are ſtill extant ſome enormous maſſes of this precious ſtone, particularly two in as many churches: but the prieſts take care to ſecure them with iron chains, leſt any body ſhould carry them off.

176 Manufactures of different kinds. In other more common manufactures the Mexicans were by no means deficient. The earthen ware of Cholula was much praiſed by the Spaniards; and they had the art of ornamenting this kind of ware with various colours, though they did not underſtand the making of glaſs. Their carpenters wrought with inſtruments of copper; and there are ſtill remains of their labours which diſplay a tolerable ſkill. Almoſt every one was acquainted with the method of making cloth. Being deſtitute of wool, common ſilk, lint, or hemp, they were obliged to ſupply the deficiency by other materials. For wool they ſubſtituted cotton, for ſilk they uſed feathers, the wool of the hare or rabbit; and inſtead of lint and hemp, they uſed the fibrous part of the leaves of the aloe. From theſe laſt they obtained a thread as fine as from lint; and from ſome ſpecies they had a coarſer ſort reſembling hemp. To obtain this thread they ſoaked the leaves in water, cleaned them, expoſed them to the ſun, and then beat them till they were fit to be ſpun. Sometimes they interwove with their cotton the fineſt down on the belly of the rabbits or hares, after having ſpun it into thread; and of theſe they made moſt beautiful cloths which were particularly uſed for winter waiſtcoats for their lords. Their cotton manufactures were equal to any produced in Europe; they wove them with different figures and colours, repreſenting different animals and flowers. Of feathers interwoven with cotton they made mantles and bed-curtains, carpets, gowns, &c. Theſe were exceedingly beautiful; but this kind of manufactory is now loſt, though there are ſtill ſome of theſe garments in the poſſeſſion of the principal lords, who wear them upon ſolemn occaſions.

177 Their horrible religion. All theſe advances towards civilization, however, in the ancient Mexicans, were much more than counterbalanced by the horrible barbarities they committed in their religious ceremonies, and in which they exceeded every nation on earth. Human ſacrifices were indeed in uſe among all the ancient heathens; but ſuch prodigious maſſacres as have been already related at the dedication of their temples, are unheard of in hiſtory. Whether they uſed theſe barbarous ſacrifices in their own country, or whether the practice began with that of the four Xochimilca priſoners, of whom we have already given an account, is not

known; but as they only uſed their priſoners or ſlaves whom they bought in this way, it is impoſſible that during the infancy of their ſtate, the number of human victims could have been very great. Moſt of thoſe unhappy creatures periſhed by having their breaſts opened, and their hearts pulled out; ſome were drowned, others ſtarved to death with hunger; and ſometimes they were burnt. Priſoners of high rank were allowed to die by what Clavigero calls the *gladiatorian* ſacrifice, which was performed in the following manner.

178 Gladiatorian ſacrifice.

Near to the greater temple of large cities, in an open ſpace of ground ſufficient to contain an immenſe number of people, was a round terrace eight feet high, upon which was placed a large round ſtone reſembling a millſtone in ſhape, but much larger almoſt three feet high, well poliſhed, and having figures cut upon it. On this ſtone, which was called *temalcatl*, the priſoner was placed, armed with a ſhield and ſhort ſword, and tied by one foot. Here he was encountered by a Mexican officer or ſoldier better armed than himſelf. If the priſoner was vanquiſhed, he was carried, dead or alive, to the temple, where his heart was taken out and offered in the uſual manner; but if he conquered ſix combatants, he gained his life and liberty. An inſtance, however, is given in which this cuſtom was infringed; for the Huetzotzincas having taken the principal lord of Cholula, a man of ſingular bravery, he overcame ſeven combatants; notwithſtanding which he was put to death; but on this account the Huetzotzincas were rendered forever infamous among theſe nations.

179 Number of human victims annually ſacrificed.

Hiſtorians differ concerning the number of victims who periſhed annually in theſe ſacrifices: Clavigero inclines to think it was 20,000, but others make it much more. Zumarraga, the firſt biſhop of Mexico, ſays in a letter of the 12th of June 1531, addreſſed to the general chapter of his order, that in that capital alone there were above 20,000 victims annually ſacrificed. Some authors, quoted by Gomara, ſay that 50,000 were annually ſacrificed in the various parts of the empire. Acoſta ſays, that there was a certain day of the year on which they ſacrificed 5000 victims, and another on which 20,000 were ſacrificed. According to others they ſacrificed, on the mountain Tepeyacac only, 20,000 annually to one of their female deities. On the other hand, Bartholomew de las Caſas reduces the number of human victims to 50 or at moſt to 100. "We are ſtrongly of opinion (ſays Clavigero), that all theſe authors have erred in the number; Las Caſas by diminution, and the reſt by exaggerating the truth."

180 Their monſtrous auſterities.

Beſides theſe cruelties which they practiſed upon others, the Mexicans were accuſtomed to treat themſelves with the moſt inhuman auſterities, thinking that the diabolical rage of their deities would be appeaſed by human blood. "It makes one ſhudder (ſays Clavigero), to read the auſterities which they practiſed upon themſelves, either in atonement for their tranſgreſſions, or in preparation for their feſtivals. They mangled their fleſh as if it had been inſenſible, and let their blood run in ſuch profuſion as if it had been a ſuperfluous fluid in the body. The effuſion of blood was frequent and daily with ſome of their prieſts. They pierced themſelves with the ſharpeſt ſpines of the aloe, and bored ſeveral parts of their bodies, particularly their ears, lips, tongue, and the fat of their arms and legs. Through the holes which they made with theſe ſpines they introduced peices of cane, the firſt of which were ſmall; but every time this penitential ſuffering was renewed a thicker piece was made uſe of. The blood which flowed from them was carefully collected in the leaves of the plant *aczojatl*. They fixed the bloody ſpines in little balls of hay, which they expoſed upon the battlements of the walls of the temple, to teſtify the penance which they did for the people. Thoſe who exerciſed ſuch ſeverities upon themſelves within the incloſure of the greater temple of Mexico, bathed in a pond that was formed there, and which, from being always tinged with blood, was called *ezapan*."

181 Their dreſs

The dreſs of the Mexicans was very ſimple; that of the men conſiſted only of a large belt or girdle, the two ends of which hung down before and behind; the women wore a ſquare mantle, about four feet long; the two ends were tied upon the breaſt or upon one ſhoulder. The Mexican gown was alſo a piece of ſquare cloth, in which the women wrapped themſelves from the waiſt down to the middle of the leg. They wore alſo a ſmall under-veſt or waiſtcoat without ſleeves, named *huepilli*.

The dreſs of the poorer ſort was made of the thread of the mountain palm, or of coarſe cotton; but thoſe of better ſtation wore the fineſt cotton, embelliſhed with various colours, and figures of animals or flowers; or woven with feathers, or the fine hair of the rabbit, &c. The men wore two or three mantles, and the women three or four veſts, and as many gowns, putting the longeſt undermoſt, ſo that a part of each of them might be ſeen. Their ſhoes were only ſoles of leather, or coarſe cloth of the mountain palm tied with ſtrings; but thoſe of the great people were adorned with ribbands of gold and jewels. They all wore long hair, and thought themſelves diſhonoured by being ſhaved, or having their hair clipped, except the conſecrated virgins in the temple. The women wore it looſe; but the men tied it up in different forms, and adorned their heads with fine feathers, both when they danced and went to war. With this ſimplicity, however, they mixed no ſmall quantity of extravagance. Beſides feathers and jewels, with which they uſed to adorn their heads, they wore ear-rings, pendants at their upper lip, as well as many at their noſes, necklaces, bracelets for the hands and arms, as well as certain rings like collars which they wore about their legs. The ear-rings of the poor were ſhells, pieces of cryſtal, amber, &c.; but the rich wore pearls, emeralds, amethyſts, or other gems, ſet in gold.

Inſtead of ſoap the Mexicans uſed a kind of fruit called *copalxocotl*; the pulp of which is white, viſcous, and very bitter, makes water white, raiſes a froth, and will clean linen like ſoap. They uſed alſo a kind of root named *amolli*, which is not unlike the *ſaponaria* of the old continent. It is now more uſed for waſhing the body, eſpecially the head, than for clothes. Clavigero ſays that there is a kind of this root which dyes the hair of a golden colour, and that he has been witneſs to this effect on the hair of an old man.

182 Modern inhabitants, &c.

The principal inhabitants of Mexico, in modern times, are Spaniards ſent hither by the court, to fill the poſts of government. They are obliged, like thoſe in the mother-country who aſpire to any eccleſiaſtical civil, or military employments, to prove that there have been neither heretics, Jews, Mohammedans, nor any perſon in their family who have been called before the inquiſition for four generations. Merchants who are deſirous of going to Mexico, as well as to other parts of America, without becoming coloniſts, are compelled to obſerve the ſame forms. They are alſo obliged to ſwear that they have 300 palms of merchandiſe, their own property, in the fleet in which they embark, and that they will not carry their wives with them. On theſe abſurd conditions they become the principal agents of the European commerce with the Indies. Though their charter is only to continue three years, and a little longer for countries more remote, it is of great importance. To them alone belongs the right of ſelling, as commiſſioners, the major part of the cargo. If theſe laws were obſerved, the merchants ſtationed in the new world would be confined to diſpoſe of what they have received on their own acount.

The predilection which adminiſtration has for Spaniards born in Europe, has reduced the Spaniſh Creoles to acquieſce in ſubordinate ſtations. The deſcendants of the companions of Cortes, and of thoſe who came after them, being conſtantly excluded from all places of honour or of truſt that were any way conſiderable have ſeen the gradual decay of the power that ſupported their fathers. The habit of being obliged to bear that unjuſt contempt with which they have been treated, has at laſt made them become really contemptible. They have totally loſt, in the vices which originate from indolence, from the heat of the climate, and from a ſuperfluous enjoyment of all things, that firmneſs and that ſort of pride which have ever characteriſed their nation. A barbarous luxury, ſhameful pleaſures, and romantic intrigues, have enervated all the vigour of their minds, and ſuperſtition hath completed the ruin of their virtues. Blindly devoted to prieſts too ignorant to enlighten them by their inſtructions, too depraved to edify them by their example, and too mercenary to attend to both theſe duties of their function, they have no attachment to any part of their religion but that which enfeebles the mind, and have neglected what might have contributed to rectify their morals.

The Meſtees, who conſtitute the third order of citizens, are held in ſtill greater contempt. It is well known that the court of Madrid, in order to repleniſh a part of that dreadful vacancy which the avarice and cruelty of the conquerors had occaſioned, and to regain the confidence of thoſe who had eſcaped their fury, encouraged as much as poſſible the marriage of Spaniards with Indian women. Theſe alliances, which became pretty common throughout all America, were particularly frequent in Mexico, where the women had more underſtanding and were more agreeable than in other places. The Creoles transferred to this mixed progeny the contemptuous ſlight they received from the Europeans. Their condition, equivocal at firſt, in proceſs of time was fixed between the whites and the blacks.

Theſe blacks are not very numerous in Mexico. As the natives are more intelligent, more robuſt, and more induſtrious, than thoſe of the other colonies, they have hardly introduced any Africans except ſuch as were required either to indulge the caprice, or perform the domeſtic ſervice, of rich people. Theſe ſlaves, who are much beloved by their maſters, on whom they abſolutely depend, who purchaſed them at an extravagant price, and who make them the miniſters of their pleaſures, take advantage of the high favour they enjoy, to oppreſs the Mexicans. They aſſume over theſe men, who are called *free*, an aſcendant which keeps up an implacable hatred between the two nations. The law has ſtudied to encourage this averſion, by taking effectual meaſures to prevent all connection between them. Negroes are prohibited from having any amorous correſpondence with the Indians; the men, on pain of being mutilated; the women, of being ſeverely puniſhed. On all theſe accounts, the Africans, who in other ſettlements are enemies to Europeans, are in the Spaniſh Indies their warm friends.

Authority has no need of this ſupport, at leaſt in Mexico, where population is no longer what it was formerly. The firſt hiſtorians, and thoſe who copied them, have recorded, that the Spaniards found there 10,000,000 of ſouls. This is ſuppoſed to have been the exaggerated account of conquerors, to exalt the magnificence of their triumph; and it was adopted, without examination, with ſo much the more readineſs, as it rendered them the more odious. We need only trace with attention the progreſs of thoſe ruffians who at firſt deſolated theſe fine countries, in order to be convinced that they had not ſucceeded in multiplying men at Mexico and the adjacent parts, but by depopulating the centre of the empire; and that the provinces which are remote from the capital, differed in nothing from the other deſerts of South and North-America. It is making a great conceſſion, to allow that the population of Mexico has only been exaggerated one-half: for it does not now much exceed 2,000,000.

183
Mexicans cruelly treated by the Spaniards.

It is generally believed, that the firſt conquerors maſſacred the Indians out of wantonneſs, and that even the prieſts incited them to theſe acts of ferocity. Undoubtedly theſe inhuman ſoldiers frequently ſhed blood without even an apparent motive; and certainly their fanatic miſſionaries did not oppoſe theſe barbarities as they ought to have done. This was not, however the real cauſe, the principal ſource of the depopulation of Mexico; it was the work of a ſlow tyranny, and of that avarice which exacted from its wretched inhabitants more rigorous toil than was compatible with their conſtitution and the climate.

This oppreſſion was coeval with the conqueſt of the country. All the lands were divided between the crown, the companions of Cortes, and the grandees or miniſters who were moſt in favour at the court of Spain. The Mexicans, appointed to the royal domains, were deſtined to public labours, which originally were conſiderable. The lot of thoſe who were employed on the eſtates of individuals was ſtill more wretched. All groaned under a dreadful yoke: they were ill fed; they had no wages given them; and ſervices were required of them, under which the moſt robuſt men would have ſunk. Their misfortunes excited the compaſſion of Bartholomew de las Caſas.

184
Bartholomew de las Caſas takes their part.

This man, ſo famous in the annals of the new world, had accompanied his father in the firſt voyage made by Columbus. The mildneſs and ſimplicity of the Indians affected him ſo ſtrongly, that he made himſelf an eccleſiaſtic, in order to devote his labours to their converſion. But this ſoon became the leaſt of his attention. As he was more a *man* than a *prieſt*, he felt more for the cruelties exerciſed againſt them than for their ſuperſtitions. He was continually hurrying from one hemiſphere to the other, in order to comfort the people for whom he had conceived an attachment, or to ſoften their tyrants. This conduct which made him be idolized by the one and dreaded by the other, had not the ſucceſs he expected. The hope of ſtriking awe, by a character revered among the Spaniards, determined him to accept the biſhopric of Chiapa in Mexico. When he was convinced that this dignity was an inſufficient barrier againſt that avarice and cruelty which he endeavoured to check, he abdicated it. It was then that this courageous, firm, diſintereſted man, accuſed his country before the tribunal of the whole univerſe. In his account of the tyranny of the Spaniards in America, he accuſes them of having deſtroyed 15,000,000 of Indians. They ventured to find fault with the acrimony of his ſtyle; but no one convicted him of exaggeration. His writings, which indicate the amiable turn of his diſpoſition, and the ſublimity of his ſentiments, have ſtamped a diſgrace upon his barbarous countrymen, which time hath not, and never will efface.

185
In conſequence of which their condition is rendered ſomewhat eaſier,

The court of Madrid, awakened by the repreſentations of the virtuous Las Caſas, and by the indignation of the whole world, became ſenſible at laſt, that the tyranny it permitted was repugnant to religion, to humanity, and to policy, and reſolved to break the chains of the Mexicans. Their liberty was now only conſtrained by the ſole condition, that they ſhould not quit the territory where they were ſettled. This precaution owed its origin to the fear that was entertained of their going to join the wandering ſavages to the north and ſouth of the empire.

With their liberty their lands ought alſo to have been reſtored to them; but this was not done. This injuſtice compelled them to work ſolely for their oppreſſors. It was only decreed, that the Spaniards, in whoſe ſervice they laboured, ſhould ſtipulate to keep them well, and pay them to the amount of 5 l. 5 s. ſterling a year.

From theſe profits the tribute impoſed by government was ſubtracted, together with 4 s. 4½ d. for an inſtitution which it is aſtoniſhing the conquerors ſhould have thought of eſtabliſhing. This was a fund ſet apart in each community, and appropriated to the relief of ſuch Indians as were decayed or indiſpoſed, and to their ſupport under private or public calamities.

The diſtribution of this fund was committed to their caciques. Theſe were not the deſcendants of thoſe whom they found in the country at the time of the conqueſt. The Spaniards choſe them from among thoſe Indians who appeared the moſt attached to their intereſts; and were under no apprehenſion at making theſe dignities hereditary. Their authority was limited to the ſupporting the police in their diſtrict, which in general extended eight or ten leagues; to the collecting the tribute of thoſe Indians who laboured on their own account, that of the others being ſtopt by the maſters whom they ſerved; and to the preventing their flight by keeping them always under their inſpection, and the not ſuffering them to contract any engagement without their conſent. As a reward of their ſervices, theſe magiſtrates obtained from government a property. They were permitted to take out of the common ſtock 2¼ d. annually for every Indian under their juriſdiction. At laſt they were empowered to get their fields cultivated by ſuch young men as were not yet ſubject to the poll tax; and to employ girls, till the time of their marriage, in ſuch occupations as were adapted to their ſex, without allowing them any ſalary except their maintenance.

Theſe inſtitutions, which totally changed the condition of the Indians of Mexico, irritated the Spaniards to a degree not to be conceived. Their pride would not ſuffer them to conſider the Americans as free men; nor would their avarice permit them to pay for labour which hitherto had coſt them nothing. They employed themſelves ſucceſſively, or in combination, craft, remonſtrances, and violence, to effect the ſubverſion of an arrangement which ſo ſtrongly contradicted their warmeſt paſſions; but their efforts were ineffectual. Las Caſas had raiſed up for his beloved Indians protectors who ſeconded his deſign with zeal and warmth. The Mexicans themſelves, finding a ſupport, impeached their oppreſſors before the tribunals; and even the tribunals that were either weak or in the intereſt of the court. They carried their reſolution ſo far, as even unanimouſly to refuſe to work for thoſe who had treated any of their countrymen with injuſtice. This mutual agreement, more than any other circumſtance, gave ſolidity to the regulations which had been decreed. The other, preſcribed by the laws was, gradually eſtabliſhed. There was no longer any regular ſyſtem of oppreſſion; but merely ſeveral of thoſe particular vexations which a vanquiſhed people, who have loſt their government, can hardly avoid from thoſe who have ſubdued it.

Theſe clandeſtine acts of injuſtice did not prevent the Mexicans from recovering, from time to time, certain detached portions of that immenſe territory of which their fathers had been deſpoiled. They purchaſed them of the royal domain, or of the great proprietors. It was not their labour which enabled them to make theſe acquiſitions; for this they were indebted to the happineſs of having diſcovered ſome of them mines, others treaſures, which had been concealed at the time of the conqueſt. The greateſt number derived their reſources from the prieſts and monks, to whom they owed their exiſtence.

Even thoſe who experienced a fortune leſs propitious, procured for themſelves, by the ſole profits of their pay, more conveniences than they had enjoyed before they underwent a foreign yoke. We ſhould be very much deceived if we ſhould judge of the ancient proſperity of the inhabitants of Mexico by what has been ſaid of its emperor, its court, its capital, and the governors of its provinces. Deſpotiſm had there produced thoſe fatal effects which it produces every where. The whole ſtate was ſacrificed to the caprices, pleaſures, and magnificence, of a ſmall number of perſons.

The government drew conſiderable advantages from the mines which it cauſed to be worked, and ſtill greater from thoſe which were in the hands of individuals. The ſalt-works greatly added to its revenue. Thoſe who followed agriculture, at the time of harveſt paid in a kind of a third of all the produce of the lands, whether they belonged to them as their own property, or whether they were only the farmers of them. Men who lived by the chace, fiſhermen, potters, and all mechanics, paid the ſame proportion of their induſtry every month. Even the poor were taxed at certain fixed contributions, which their labour or their alms might put them in a condition to pay.

The Mexicans are now leſs unhappy. Our fruits, our corn, and our cattle, have rendered their food more wholeſome, agreeable, and abundant. Their houſes are better built, better diſpoſed, and better furniſhed. Shoes, drawers, ſhirts, a garment of wool or cotton, a ruff, and a hat, conſtitute their dreſs. The dignity which it has been agreed to annex to theſe enjoyments has made them better economiſts and more laborious. This caſe, however, is far from being univerſal; it is even very uncommon in the vicinity of the mines, towns, and great roads, where tyranny ſeldom ſleeps: but we often find it with ſatisfaction in remote parts, where the Spaniards are not numerous, and where they have in ſome meaſure become Mexicans.

The employments of this people are very various. The moſt intelligent, and thoſe who are in eaſy circumſtances, devote themſelves to the moſt neceſſary and moſt uſeful manufactures, which are diſperſed through the whole empire. The moſt beautiful manufactures, are eſtabliſhed among the people of Tlaſcala. Their old capital, and the new one, which is called *Angelos*, are the centre of this induſtry. Here they manufacture cloth that is pretty fine, callicoes that have an agreeable appearance, certain ſlight ſilks, good hats, gold lace, embroidery, lace, glaſſes, and a great deal of hard-ware.

186
Manufactures and produce of the country.

The care of flocks affords a maintenance to ſome Mexicans, whom fortune or nature have not called to more diſtinguiſhed employments. America, at the time it was diſcovered, had neither hogs, ſheep, oxen, horſes, nor even any domeſtic animal. Columbus carried ſome of theſe uſeful animals to St Domingo, from whence they were generally diſperſed, and at Mexico more than in any other place. Theſe have multiplied prodigiouſly. They count their horned cattle by thouſands, whoſe ſkins are become an object of conſiderable exportation. The horſes are degenerated, but the quality is compenſated by the number. Hog's lard is here ſubſtituted for butter. Sheep's wool is dry, coarſe, and bad, as it is every where between the tropics.

The vine and olive-tree have experienced the ſame degeneracy. The cultivation of them was at firſt prohibited, with a view of leaving a free market for the commodities of the mother country. In 1706, permiſſion was given to the Jeſuits, and a little afterwards to the marquis Del Valle, a deſcendant from Cortes, to cultivate them. The attempts have not proved ſucceſsful. The trials, indeed, that have been made, have not been abandoned; but no perſon has ſolicited the liberty of following an example which did not promiſe any great emoluments. Other cultures have been more ſucceſsful. Cotton, ſugar, ſilk, cocoa, tobacco, and European corn, have all thriven in ſome degree. The Spaniards are encouraged to proſecute the labours which theſe cultures require, from the happy circumſtance of their having diſcovered iron mines, which were entirely unknown to the Mexicans, as well as ſome mines of a kind of copper that is hard enough to ſerve for implements of huſbandry. All theſe articles, however, for want of men and induſtry, are merely conſumed within the country.—There is only the vanilla, indigo, and cochineal, which make part of the trade of Mexico with other nations.

New-Mexico, ſo called becauſe of its being diſcovered later than Old-Mexico, a country of America, is bounded on the north by high mountains, beyond which is a country altogether unknown; by Louiſiana on the eaſt; by New Spain on the ſouth; and on the weſt by the gulph of California, and the Rio Colorado; extending it is ſaid, above 100 miles from eaſt to weſt, and about 900 from ſouth to north; but the twentieth part of the country within theſe limits is neither cultivated nor inhabited either by Spaniards or Indians. As it lies in the midſt of the temperate zone, the climate, in general, is very pleaſant; the ſummers, though very warm, are neither ſultry nor unwholeſome; and the winters, though pretty ſharp, are far from being inſupportable, and, for the moſt part, clear and healthy.

The greateſt encomiums are laviſhed on the fertility of the ſoil, the richneſs of the mines, and the variety of valuable commodities produced in this country. It is ſaid to be beautifully diverſified with fields, meadows riſing grounds, and rivers; abounding with fruit and timber trees, turquoiſes, emeralds, and other precious ſtones, mines of gold and ſilver, a great variety of wild and tame cattle, fiſh and fowls. Upon the whole, we may ſafely affirm, that New-Mexico is among the pleaſanteſt, richeſt, and moſt plentiful countries in America, or any other part of the world. There are few great or navigable rivers in it; the moſt conſiderable are, the Rio Solado and Rio del Norte, which, with ſeveral ſmaller ſtreams, fall into the gulph of Mexico. On the coaſt of the gulph are divers bays, ports, and creeks, which might be eaſily converted into excellent harbours if the Spaniards were poſſeſſed of any portion of that commercial ſpirit which animates the other maritime nations of Europe.

The Spaniſh writers tell us, that New-Mexico is inhabited by a great variety of Indian nations or tribes, totally unconnected with each other; but the principal are the Apaches, a brave, warlike, reſolute people; fond of liberty, and the inveterate enemies of tyranny and oppreſſion. About the cloſe of the laſt century thinking themſelves aggrieved by the Spaniſh government, they made a general inſurrection, and did a great deal of miſchief; but were at laſt obliged to ſubmit, and have ſince been curbed by ſtronger garriſons. Moſt of the natives are now Chriſtians. When the Spaniards firſt entered this country, they found the natives well clothed, their lands cultivated, their villages neat, and their houſes built with ſtone. Their flocks alſo were numerous, and they lived more comfortably than moſt of the other ſavages of America. As to religion, they were idolaters, and worſhipped the ſun and moon; but whether they offered human ſacrifices, we are not ſufficiently informed.

As to the number of the provinces of this country, we can advance nothing certain: ſome writers making them only five, others 10, 15, 20, and 25; but adding no deſcription, either of them or the towns contained in them, excepting the capital, Santa Fé, which we are told ſtands near the ſource of the Rio del Norte, in 36° of north latitude, and about 130 leagues from the gulph; that it is a well-built, handſome, rich town; and the ſeat of the biſhop, ſuffragan of Mexico, as well as the governor of the province, who is ſubordinate to the viceroy of Mexico, or New-Spain.

MEYER (Felix), an eminent landſcape painter was born at Winterthur in 1653, and received his earlieſt inſtruction from a painter at Nuremburg: but he was afterwards a diſciple of Ermels, a good landſcape painter, whoſe manner he entirely followed.—In ſearch of ſtill greater improvement, however, he travelled to Italy: but the climate not agreeing with his conſtitution, he retired to Switzerland; where, as he was indefatigable in ſurveying all the beauty, the wildneſs, and magnificence of nature in thoſe romantic ſcenes, he made a multitude of noble deſigns, which procured him very high reputation. As he was not expert at painting figures, thoſe which he inſerted in his own pictures being very indifferent, ſuch of his landſcapes as were ſupplied with figures by Roos or Rugendas, are accounted moſt eſtimable. He died in 1713.

MEYSENS (John) a painter of conſiderable eminence, was born at Bruſſels in 1612; and at firſt was taught the principles of painting by Anthony van Opſtal, but afterwards he became a diſciple of Nicholas vander Horſt. When he commenced painter, he undertook both hiſtory and portrait: but the latter ſeems to have been his principal employment; and his reputation for that ſtyle of painting became very great throughout the Low Countries. His remarkable excellence conſiſted in his producing a very ſtriking reſemblance, in his finiſhing his pictures with a great deal of care, and in giving them a lively and good expreſſion.

MEZERAY (Francis Eudicede), an eminent French hiſtorian, the ſon of Iſaac Eudes a ſurgeon, was born at Rye, in Lower Normandy, in 1610; and took the ſurname of *Mezeray*, from a Hamlet near Rye. Having performed his ſtudies at Caen, he diſcovered a ſtrong inclination to poetry; but going to Paris, he, by the advice of one of his friends, applied himſelf to the ſtudy of politics and hiſtory, and procured the place of commiſſary at war, which he held for two campaigns. He then ſhut himſelf up in the college of St Barbe, in the midſt of books and manuſcripts; and, in 1643, publiſhed the firſt volume of the Hiſtory of France, in folio; and ſome years after, the other two volumes. Mezeray in that work ſurpaſſed all who had written the hiſtory of France before him, and was rewarded by the king with a penſion of 4000 livres. In 1668, he publiſhed an abridgement of his Hiſtory of France, in three volumes 4to, which was well received by the public: but as he inſerted in that work the origin of moſt of the taxes with very free reflections, Mr Colbert complained of it, when Mezeray promiſed to correct what he had done in a ſecond edition; but thoſe corrections being only palliations, the miniſter cauſed half of his penſion to be ſuppreſſed. Mezeray complained of this in very ſevere terms; when he obtained no other anſwer than the ſuppreſſion of the other half. Vexed at this treatment, he reſolved to write on ſubjects that could not expoſe him to ſuch diſappointments; and compoſed his treatiſe on the origin of the French, which did him much honour. He was elected perpetual ſecretary to the French academy; and died in 1683. He is ſaid to have been a man extremely negligent in his perſon; and ſo careleſs in dreſs, that he might have paſſed for a beggar rather than for what he was. He was actually ſeized one morning by the *archers des pauvres*, or pariſh-officers; which miſtake was ſo far from provoking him, that he was highly diverted with it, and told them, that "he was not able to walk on foot, but that as ſoon as a new wheel was put to his chariot, he would attend them wherever they thought proper." He uſed to ſtudy and write by candle-light, even at noon-day in ſummer; and, as if there had been no ſun in the world, always waited upon his company to the door with a candle in his hand. With regard to religion, he affected Pyrrhoniſm; which however was not, it ſeems, ſo much in his heart as in his mouth. This appeared from his laſt ſickneſs; for having ſent for thoſe friends who had been the moſt uſual witneſſes of his licentious talk about religion, he made a ſort of recantation, which he concluded with deſiring them "to forget what he might formerly have ſaid upon the ſubject of religion, and to remember, that Mezeray dying was a better believer than Mezeray in health." Beſides his hiſtory, he alſo wrote, 1. A continuation of the hiſtory of the Turks. 2. A French tranſlation of John de Sariſbury's Latin treatiſe on the vanities of the court. 3. There are attributed to him ſeveral ſatires againſt the government; and in particular, thoſe that bear the name of *Sandricourt*.

MEZIERS, a ſtrong town of France in Champagne, with a citadel. It was beſieged with a powerful army by Charles V. who was obliged to raiſe the ſiege in 1521. It is ſeated on the river Meaſe, partly upon a hill, and partly in a valley, in E. Long. 3. 48. N. Lat. 49. 46.

MEZIRIAC (Claude Gaſpar Backet Sieur de), one of the moſt ingenious men of the 17th century, was born at Breſſe, of an ancient and noble family. He was a good poet in French, Italian, and Latin; an excellent grammarian, a great Greek ſcholar, and an admirable critic. He was well verſed in the controverſies, both in philoſophy and religion; and was deeply ſkilled in algebra and geometry, of which laſt he gave proof by publiſhing the ſix books of Diophantes, enriched with a very able Commentary and Notes. In his youth he ſpent a conſiderable time at Paris and at Rome; at which laſt place he wrote a ſmall collection of Italian poems, in competition with Vaugelas, who was there at the ſame time; among which there are imitations of the moſt beautiful ſimilies contained in the eight firſt books of the Æneid. He alſo tranſlated Ovid's Epiſtles; a great part of which he illuſtrated with very curious Commentaries of his own. While he was at Paris, they talked of making him preceptor of Louis XIII.: upon which he left the court in great haſte, and afterwards declared that he had never felt ſo much pain upon any occaſion of his life; for he ſeemed to have already upon his ſhoulders the important weight of the whole kingdom. He undertook the tranſlation of all Plutarch's works, with notes; which he had brought nearly to a concluſion, when he died at Bourg, in Breſſe, anno 1638, at 45 years of age. He left behind him ſeveral finiſhed works, that were not printed.

MEZUZOTH, in the Jewiſh cuſtoms, certain pieces of parchment which the Jews fix to the door-poſts of their houſes, taking that literally which Moſes commands them, ſaying, "Thou ſhalt never forget the laws of thy God, but thou ſhalt write them upon the poſts of thy houſe, and on thy gates." This expreſſion means nothing elſe, but that thou ſhalt always remember them, whether thou comeſt into thy houſe or goeſt out. But the Hebrew doctors imagined, that the lawgiver meant ſomething more than this. They pretended, that to avoid making themſelves ridiculous, by writing the commandments of God without their doors, or rather to avoid expoſing themſelves to the profanation of the wicked, they ought at leaſt to write them on a parchment, and to incloſe it in ſomething. Therefore they wrote theſe words upon a ſquare piece of parchment prepared on purpoſe, with a particular ink, and a ſquare kind of character. Deut. vi. 4, 5, 6, 7, 8, 9. "Hear, O Iſrael, the Lord our God is one Lord, &c."—Then they left a little ſpace, and afterwards went on, Deut. xi. 13. "And it ſhall come to paſs, if thou ſhalt hearken diligently to my commandments, &c." as far as, "Thou ſhalt write them upon the door-poſts of thy houſe, &c." After this they rolled up the parchment, and put it into a caſe of reeds or other matter; they wrote on the end of the caſe the word *Shadai*, which is one of the names of God; and they put it at the doors of their houſes, chambers, and all places moſt frequented; they fixed it to the knockers of the door, on the right ſide: and as often as they entered in or went out they touched it in this place, with the end of their finger, which they afterwards kiſſed out of devotion. The Hebrew word *mezuza* properly ſignifies the door-poſts of a houſe; but it is alſo given to this roll of parchment now mentioned.

MEZZOTINTO, a particular manner of repreſenting figures on copper, ſo as to form prints in imitation of painting in Indian ink. See ENGRAVING.

The invention of this art has been uſually attributed to prince Rupert. Rut Baron Heinikin, a very judicious and accurate writer upon the ſubject of engraving, aſſerts, with great appearance of truth, that it was a lieutenant-colonel de Siegan, an officer in the ſervice of the landgrave of Heſſe, who firſt engraved in this manner; and that the print which he produced was a portrait of the princeſs Amelia Elizabeth of Heſſe, engraved in the year 1643. Prince Rupert learned the ſecret from this gentleman, and brought it into England when he came over the ſecond time with Charles II. Prince Rupert's print of An Executioner holding a Sword in one Hand and a Head in the other, a half length, from Spagnoletto, is dated 1658. This art has never been cultivated with ſucceſs in any country but England.

The prince laid his grounds on the plate with a channelled roller; but one Sherwin, about the ſame time, laid his grounds with a half-round file, which was preſſed down with a heavy piece of lead. Both theſe grounding tools have been laid aſide for many years; and a hand-tool, reſembling a ſhoemaker's cutting-board-knife, with a fine creſelling on the edge, was introduced by one Edial, a ſmith by trade, who afterwards became a mezzotinto painter.

It is very different from the common way of engraving. To perform it, they rake, hatch, or punch, the ſurface of the plate all over with a knife, or inſtrument made for the purpoſe, firſt one way, then the other, acroſs, &c. till the ſurface of the plate be thus entirely furrowed with lines or furrows, cloſe and as it were contiguous to each other; ſo that, if an impreſſion was then taken from it, it would be one uniform blot or ſmut. This done, the deſign is drawn or marked on the ſame face; after which, they proceed with burniſhers, ſcrapers, &c. to expunge and take out the dents or furrows, in all the parts where the lights of the piece are to be; and that more or leſs as the lights are to be ſtronger or fainter; leaving thoſe parts black which are to repreſent the ſhadows or deepenings of the draught.

As it is much eaſier to ſcrape or burniſh away parts of a dark ground correſponding with the outline of any deſign ſketched upon it, than to form ſhades upon a light ground by an infinite number of hatches, ſtrokes, and points, which muſt all terminate with exactneſs on the outline, as well as differ in their force and manner; the method of ſcraping, as it is called, in mezzotinto, conſequently becomes much more eaſy and expeditious than any other method of engraving. The inſtruments uſed in this kind of engraving are cradles, ſcrapers, and burniſhers.

In this engraving, the plate muſt be prepared and poliſhed in the ſame manner as for other engraving; and afterwards divided equally by lines parallel to each other, and traced out with very ſoft chalk.—The diſtance of theſe lines ſhould be about one-third of the length of the face of the cradle which is to be uſed, and theſe lines ſhould be marked with capital letters, or ſtrokes of the chalk. The cradle is then to be placed exactly betwixt the two firſt lines, and paſſed forwards in the ſame direction; being kept as ſteady as poſſible, and preſſed upon with a moderate force. The ſame operation muſt be repeated with reſpect to all the other lines; till the inſtrument has thus paſſed over the whole ſurface of the plate.—Other lines muſt be then drawn from the extremities of the other two ſides, in the ſame manner; which, interſecting the firſt at right angles, will with them form ſquares; and the ſame operation muſt be repeated with the cradle as in the caſe of the firſt. New lines muſt then be drawn diagonally, and the cradle paſſed betwixt them as before; and when the firſt diagonal operation is performed, the lines muſt be croſſed at right angles as the former, and the

Mezzotinto.

cradles paſſed betwixt them in the ſame manner.—The plate having undergone the action of the cradle, according to the diſpoſition of the firſt order of lines, a ſecond ſet muſt be formed, having the ſame diſtances from each other as the firſt. But they muſt be ſo placed as to divide thoſe already made into ſpaces one-third leſs than their whole extent; *i. e.* every one after the firſt on each ſide will take in one-third of that before it, *e. g.* beginning at A, of which the firſt third muſt be left out; a third of B will conſequently be taken in, and ſo of the reſt. Theſe lines of the ſecond order muſt be marked with ſmall letters, or leſſer ſtrokes to diſtinguiſh them from the firſt: and the ſame treatment of the plate muſt be purſued with reſpect to them as was practiſed for the others. When this ſecond operation is finiſhed, a third order of lines muſt be made; the firſt of which, *e. g.* in A, muſt omit two-thirds of it, and conſequently take in two-thirds of B, &c. By theſe means, the original ſpaces will be exactly divided into equal thirds; and the cradle muſt be again employed betwixt theſe lines as before.—When the whole of this operation is finiſhed, it is called *one turn;* but in order to produce a very dark and uniform ground, the plate muſt undergo the repetition of all theſe ſeveral operations for above twenty times; beginning to paſs the cradle again betwixt the firſt lines, and proceeding in the ſame manner through all the reſt. When the plate is prepared with a proper ground, the ſketch muſt be chalked on it, by rubbing the paper on the backſide with chalk. It is alſo proper to overtrace it afterwards with black lead or Indian ink. The ſcraping is then performed, by pairing or cutting away the grain of the ground in various degrees; ſo that none of it is left in the original ſtate except in the touches of the ſtrongeſt ſhade. The general manner of proceeding is the ſame as drawing with white upon black paper. The maſſes of light are firſt begun with; and thoſe parts which go off into light in their upper part, but are brown below: the reflections are then entered upon; after which the plate is blackened with a printer's blacking-ball made of felt in order to diſcover the effect; and then the work is proceeded with; obſerving always to begin every part in the places where the ſtrongeſt lights are to be.

The art of ſcrapiug mezzotintoes has been applied to the printing with a variety of colours, in order to produce the reſemblance of paintings. The inventor of the method of doing this was J. C. Le Blon, a native of Frankfort, and pupil of Carlo Maratta, between the years 1720 and 1730. It was eſtabliſhed by the inventor on this principle, that there are three primitive colours, of which all the reſt may be compoſed by mixing them in various proportions; that any two of theſe colours being mixed together, preſerve their original power, and only produce a third colour ſuch as their compound muſt neceſſarily give; but if tranſparent colours be mixed, and three primitive kinds compounded together, they deſtroy each other, and produce black, or a tendency to it, in proportion to the equality or inequality of the mixture; and that if, therefore, theſe three colours be laid, either ſeparately or upon each other, by three plates, engraved correſpondently on theſe principles to the colouring of the deſign the whole variety of teints neceſſary may be produced, The requiſites, therefore, to the execution of any deſign in this method of printing are as follow: 1. To ſettle a plan of the colouring to be imitated; ſhowing where the preſence of each of the three ſimple colours is neceſſary, either in its pure ſtate or combined with ſome other to produce the effect required; and to reduce this plan to a painted ſketch of each, in which not only the proper outlines, but the degree of ſtrength ſhould be expreſſed. 2. To engrave three plates according to this plan, which may print each of the colours exactly in the places where, and proportion in which, they are wanted. 3. To find three tranſparent ſubſtances proper for printing with theſe three primitive colours. The manner in which Mr Le Blon prepared the plates was as follows: The three plates of copper were firſt well fitted with reſpect to ſize and figure to each other, and grounded in the ſame manner as thoſe deſigned for mezzotinto prints; and the exact place and boundary of each of the three primitive colours, conformably to the deſign, were ſketched out on three papers, anſwering in dimenſions to the plate. Theſe ſketches were then chalked on the plates; and all the parts of each plate that were not to convey the colour to which it was appropriated to the print, were entirely ſcraped away, as in forming the light of mezzotinto prints. The parts that were to convey the colours were then worked upon; and where the moſt light or diluted teints of the colour were to be, the grain in the ground was proportionally taken off; but where the full colour was required, it was left entire. In this regard was had, not only to the effects of the colour in its ſimple ſtate, but to its combined operation, either in producing orange-colour, green, or purple, by its admixture with one alone; and likewiſe to its forming brown, grey, and ſhades of different degrees, by its co-operation with both the others. But though the greateſt part of the engraving was performed in the mezzotinto manner, yet the graver was employed occaſionally for ſtrengthening the ſhades, and for correcting the outline where it required great accuracy and ſteadineſs. It was found neceſſary ſometimes to have two ſeparate plates for printing the ſame colour, in order to produce a ſtronger effect: but the ſecond plate, which was uſed to print upon the firſt, was intended only to glaze and ſoften the colours in particular parts that might require it. With reſpect to the black and brown teints, which could not be ſo conveniently produced in a due degree by the mixture of the colours, umber and black were likewiſe uſed.

With reſpect to the order in which the plates are to be applied, it may be proper to obſerve, that the colour which is leaſt apparent in the picture ſhould be laid on firſt; that which is betwixt the moſt and leaſt apparent next; and that which predominates laſt; except where there may be occaſion for two plates for the ſame colour, as was before-mentioned; or where there is any required for adding browns and ſhades.

Mr Le Blon applied this art to portraits, and ſhowed, by the ſpecimens he produced, the poſſibility of its being brought, by farther improvements, to afford imitations of painting which might have ſome value. It is nevertheleſs much better adapted to the ſimpler ſubjects, where there are fewer intermixtures of colours; and where the accuracy of the reflections, and demi-teints, are not ſo eſſentially neceſſary to the truth of the deſign, from the greater latitude of form, and diſpoſition of the colour, as in plants, anatomical figures, and ſome ſubjects of architecture. But perhaps plates engraved or rather finiſhed with the tool, particularly with reſpect to the outline, would be better accommodated in ſome of theſe caſes than thoſe prepared only by ſcraping.

Mr Cochin remarks, at the end of an account he has given of Mr Le Blon's manner, that though this ingenious artiſt confined his method principally to the uſe of three colours; yet, ſhould this invention be again taken up and cultivated, there would be more probability of ſucceſs in uſing a greater variety: and that ſeveral different kinds might be printed by one plate; provided they were laid on in their reſpectively proper places by printing-balls, which ſhould be uſed for that colour only. His hint might however be very greatly improved, by the further aſſiſtance of pencils, accommodated to the plates, for laying on the colours in the proper parts.—For the method of taking off mezzotinto prints on glaſs, ſee *Back-painting*.

MIASMA, among phyſicians, a particular kind of effluvia, by which certain fevers, particularly intermittents are produced.

MICA, DAZE, *Talc*, *Muſcovy-glaſs*, *Glimmer*, or *Gliſt*; a genus of magneſian earths, known by the following characters: 1. They conſiſt of thin flexible particles, diviſible into plates or leaves, having a ſhining ſurface. 2. Theſe leaves or ſcales, expoſed to the fire, loſe their flexibility and become brittle, ſeparating afterwards into thinner leaves: but in a quick and ſtrong fire they curl or crumple, which is a ſtep towards fuſion; though it is very difficult to reduce them into pure glaſs without addition. 3. They melt eaſily with borax, the microcoſmic ſalt, and alkaline ſalt; and, by means of the two former ſalts, may be brought to a clear glaſs before the blow-pipe. That which contains iron, however, is more fuſible than the uncoloured earths of this kind. No looſe or friable mica has yet been diſcovered, but all of an indurated kind. Its ſpecific gravity, according to Fabroni, is about 3000. Kirwan tells us, that the ſpecific gravity of this ſubſtance, when it contains much iron, is from 2535 to 3000. An hundred parts of the colourleſs kind contain 38 of ſilex, 28 of argill, 20 of magneſia, and 14 of the moſt dephlogiſticated calx of iron. Martial mica contains alſo 10 or 12 *per cent.* of a more phlogiſticated calx of iron; whence its various colours are derived, and a proportionably ſmaller quantity of the other ingredients. The ſpecies are,

I. Mica alba, colourleſs or pure mica; of which there are the following varieties. 1. Muſcovy glaſs, conſiſting of large parallel plates, and as tranſparent as glaſs, found in Siberia and Sweden. This differs externally from the common talc, in being more ſoapy to the touch. An hundred parts of it contain 50 of ſilex, 45 of mild magneſia, and 5 of argill or clay. Venetian talc is white, grey, yellowiſh, or greeniſh, and ſemitranſparent. It is much more tender and brittle than mica, and ſo ſoft that it may be ſcratched with the nail. Its ſpecific gravity is 2729. 2. Mica ſquamoſa, compoſed of ſmall plates, found in Sweden and other coutries of Europe. 3. Compoſed of fine particles like chaff. 4. Talcum officinale, crumpled mica, compoſed of crumpled plates.

II. Mica colorata martialis, coloured and martial glimmer. Of this there are many varieties. 1. Brown and ſemitranſparent, found in Lapland. 2. Conſiſting of fine and minute ſcales, of a brown, deep-green, light-green, or black colour, found in different parts of Sweden. 3. Twiſted or crumpled glimmer, of a light green colour, found alſo in Sweden. 4. Chaffy glimmer, of a black colour, found in the ſtone called *hornberg*, occurring in moſt of the Swediſh copper mines, as at Norberg, Fledberg, &c. 5. Cryſtalliſed glimmer, with erect ſcales, or with hexagonal horizontal plates, found alſo in Sweden.

Moſt of theſe ſtones are ſuppoſed abſolutely to reſiſt the fire; but this is to be underſtood only of certain degrees of heat, and when they are mixed with certain bodies. Cronſtedt obſerves, however, that they may with equal propriety be called *apyrous*; becauſe they melt with that degree of heat in which neither quartz nor limeſtone are in the ſmalleſt degree altered. They are ſtill more readily melted when either naturally or artificially combined with a martial earth. Hence ſome ores, though much mixed with mica, may be very readily melted; while others, in which the ſame ſubſtance is mixed with quartz, it may be impoſſible to melt; becauſe the mica renders the quartz ſo compact as to prevent it from cracking. It does the ſame with an apyrous clay, which is the reaſon why the lapis ollaris reſiſts the fire ſo ſtrongly.

M. Margraaf aſſerts, that he has obtained Epſom ſalt from talc; and Mr Fabroni informs us, that in decompoſing nitre by means of a micaceous ſubſtance, as ſoon as the acid is diſtilled there riſes ſome other ſubſtance hitherto unknown at the end of the operation: he adds, that on employing aqua regia or marine acid to diſſolve this ſubſtance, the yellow colour which reſults from the ſolution ſhows that it contains ſome iron. This laſt aſſertion is confirmed by M. Monnet, who found that phlogiſticated alkali and ſolution of galls produce a bluiſh colour with that of mica. He adds, that its component parts are the ſame with thoſe of aſbeſtos, excepting only that the latter contains more iron.

Cronſtedt informs us, that the martial mica acquires a ſhining yellow colour in a calcining heat, which has induced many to examine it in hopes of finding gold; though no metal can be obtained from it except iron, which may be diſſolved by means of aqua regia. A late German author indeed has pretended, that he produced from mica an unknown ſemimetal which reſembled iron mixed with zinc. He owned, however, that he made uſe of a flux compoſed of ſeveral metals, ſome of which probably united with the talc, and thus deceived him. The talc cubes, which are mica formed into bodies of the figure of aluminous cryſtals, are much valued and ſought after by ſome mineralogiſts. They are met with in ſome parts of Sweden; and when broken are found to conſiſt of an iron ore frequently mixed with a mineraliſed copper ore, and are only covered with a very thin coat of mica. The broad and tranſparent talc named *Muſcovy-glaſs* is uſed inſtead of glaſs for windows; and has this advantage above common glaſs, that it reſiſts the exploſion of cannon. Cronſtedt thinks that it might be advantageouſly uſed for covering houſes. The twiſted or crumpled mica, found in ſome places of Sweden, is manufactured into kettles and other veſſels, likewiſe into hearths for chimneys; "and the powder which falls in the working (ſays our author) may be mixed with the common ſalt for the diſtillation of the muriatic acid."

According to M. Magellan, many mineral ſubſtances may have the glittering appearance of talc without really belonging to that genus. An artificial production of this kind he happened to obſerve in Mr Wedgewood's work. It was an unexpected reſult from vitriol calcined to redneſs, then mixed without being waſhed with common ſalt. It now underwent a ſecond calcination under a muffle, with a heat ſomewhat ſtronger; about the tenth degree of his thermometer. The colour was of a dark purple, and the ſhining particles ſo bright as to ſhow their glaſſy form, very different from true mica.

MICAH, or *The Book of Micah*, a canonical book of the Old Teſtament, written by the prophet Micah, who is the ſeventh of the twelve leſſer prophets. He is cited by Jeremiah, and propheſied in the days of Jotham, Ahaz, and Hezekiah. He cenſures the reigning vices of Jeruſalem and Samaria, and denounces the judgments of God againſt both kingdoms. He likewiſe foretels the confuſion of the enemies of the Jews, the coming of the Meſſiah, and the glorious ſucceſs of his church.

MICHAEL, or MICHEL, (i. e. *who is like to God?*) The ſcripture account of Michael is, that he was an archangel, who preſided over the Jewiſh nation, as other angels did over the Gentile world, as is evident of the kingdoms of Perſia and Greece, (Dan. x. 13.); that he had an army of angels under his command (Rev. xii. 7.); that he fought with the Dragon, or Satan and his angels; and that, contending with the Devil, he diſputed about the body of Moſes, (Jude 9.) As to the combat between Michael and the Dragon, ſome authors underſtand it literally, and think it means the expulſion of certain rebellious angels, with their head or leader, from the preſence of God. Others take it in a figurative ſenſe; and refer it, either to the conteſt that happened at Rome between St Peter and Simon Magus, in which the apoſtle prevailed over the magician, or to thoſe violent perſecutions under which the church laboured for three hundred years, and which happily ceaſed when the powers of the world became Chriſtians. Among the commentators who maintain the former opinion is Grotius; and among thoſe who take it in a figurative ſenſe are Hammond and Mede.

The conteſt about the body of Moſes is likewiſe taken both literally and figuratively. Thoſe who underſtand it literally are of opinion, that Michael by the order of God hid the body of Moſes after his death; and that the Devil endeavoured to diſcover it, as a fit means to entice the people to idolatry, by a ſuperſtitious worſhip of his relics. But this diſpute is figuratively underſtood to be a controverſy about rebuilding the temple, and reſtoring the ſervice of God among the Jews at Jeruſalem; the Jewiſh church being fitly enough ſtyled the body of Moſes. It is thought by ſome, that this ſtory of the conteſt between Michael and the Devil was taken by St Jude out of an apocryphal book called, *The Aſſumption of Moſes*.

The Romiſh church celebrates three appearances of Michael, of which no mention is made in ſcripture, and which have happened, they ſay, a long time after the age of the apoſtles. The firſt appearance of this archangel was at Coloſſæ in Phrygia, but at what time is uncertain. The ſecond is that of mount Garganus, in the kingdom of Naples, about the end of the fifth century. The third is his appearance to Aubert biſhop of Avranches, upon a rock called the *Tomb*, where at this day is the abbey of St Michael. This was about the year 706. The firſt of theſe feſtivals is obſerved on the 6th of September, the ſecond on the 8th of May, and the laſt on the 16th of October. It has been ſuppoſed, that it was Michael the archangel who conducted the Iſraelites in their journey through the wilderneſs, (ſee Ex. xxxii. 20, 23, and xxxiii. 2.); that it was he who appeared to Moſes in the burning buſh; who appeared to Joſhua in the fields of Jericho; and to Gideon and Manoah the father of Sampſon; and, in a word, to him have been imputed the greateſt part of the moſt remarkable appearances either in the Old or New Teſtament.

MICHAEL ANGELO. See ANGELO.

Mount MICHAEL, one of the moſt celebrated ſtate-priſons of France, lies about 20 miles from Granville. It is a rock ſituated in the middle of the bay of Avranches; and is only acceſſible at low water. Nature has completely fortified one ſide, by its craggy and almoſt perpendicular deſcent, which renders it impracticable to mount it by any addreſs or courage, however conſummate. The other parts are ſurrounded by walls fenced with ſemilunar towers after the Gothic manner; but ſufficiently ſtrong, together with the advantage of its ſituation, to render it impregnable to any attack. At the foot of the mountain begins a ſtreet or town, which winds round its baſe to a conſiderable height. Above are chambers where ſtate-priſoners are kept, and where there are other buildings intended for reſidence. On the ſummit is erected the abbey itſelf, occupying a prodigious ſpace of ground, and of a ſtrength and ſolidity equal to its enormous ſize; ſince it has for many centuries withſtood all the injuries of the weather, to which it is ſo much expoſed. In an apartment, called the *Sale de` Chevalerie*, the knights of St Michael uſed to meet in ſolemn convocation on important occaſions. They were the defenders and guardians of this mountain and abbey, as thoſe of the temple, and of St John of Jeruſalem, were of the holy ſepulchre. The hall in which they met is very ſpacious, but rude and barbarous. At one end is a painting of the archangel, the patron of their order; and in this hall Louis XI. firſt inſtituted and inveſted with the inſignia of knighthood the chevaliers of the croſs of St Michael. There is a miſerable dark apartment, or rather dungeon, in which many eminent perſons were formerly confined. In the middle of it is a cage, compoſed of prodigious bars of wood; and the wicket which gives entrance into it is 10 or 12 inches in thickneſs. The inſide of it compriſes about 12 or 14 feet ſquare, and it is nearly 20 in height. Towards the latter end of the laſt century, a certain newſwriter in Holland, who had preſumed to print ſome very ſevere and ſarcaſtic reflections on Madame de Maintenon, was confined to this place. Some months after his publication, he was induced, by a perſon ſent expreſsly for that purpoſe, to make a tour into French Flanders. The moment he had quitted the Dutch territories, he was put under arreſt; and immediately, by his majeſty's expreſs command, conducted to Mount Michael, where he was ſhut up in this cage. Here he lived upwards of 23 years; and here he at length expired. During the long nights of winter, no candle or fire was allowed him. He was not permitted to have any book. He ſaw no human face, except the gaoler, who came once every day to preſent him, through a hole in the wicket, with his little portion of bread and wine. No inſtrument was given him with which he could deſtroy himſelf; but he found means at length to draw out a nail from the wood with which he engraved, or cut on the bars of his cage, certain fleurs de lis and armorial bearings, which formed his only employment and recreation. They are very curiouſly performed conſidering the rudeneſs of his tool.

The ſubterraneous chambers in this mountain are ſaid to be ſo numerous, that the gaolers themſelves do not know them. There are certain dungeons called *aubliettes*, into which they were accuſtomed anciently to let down malefactors guilty of very heinous crimes; they provided them with a loaf of bread and a bottle of wine, and then they were totally forgotten, and left to periſh by hunger in the dark vaults of the rock. This puniſhment, however, has not been inflicted by any king in the laſt or preſent century.

Here alſo is a remarkable chamber, in one corner of which is a kind of window: between this and the wall of the building is a very deep ſpace, of near 100 feet perpendicular, at the bottom of which is another window opening to the ſea. It is called the *Hole of Montgomeri;* and the hiſtory of it is as follows: In the year 1559, Henry II. king of France was unfortunately killed at a tournament by the count de Montgomeri. †. He was a Huguenot; and having eſcaped the maſſacre of Paris, made head againſt the royal forces in Normandy, ſupported by queen Elizabeth with arms and money. Being driven from his fortreſſes in theſe parts, he retired to a rock called the *Tombelaine.* This is another ſimilar to Mount Michael; only three quarters of a league from it, and of nearly equal dimenſions. At that time there was a caſtle upon it, which has ſince been demoliſhed, and of which ſcarce any veſtiges now remain. From this fortreſs, acceſſible only at low-water, he continually made excurſions and annoyed the enemy, who never dared to attack him. He coined money, laid all the adjacent country under contribution, and rendered himſelf univerſally dreaded. Deſirous, however, to ſurpriſe Mount Michael, he found means to engage one of the monks reſident in the abbey; who promiſed to give him the ſignal for this enterpriſe by diſplaying a handkerchief. The monk having made the ſignal, betrayed him, and armed all his aſſociates, who waited Montgomeri's arrival. The chieftain came, attended by 50 choſen ſoldiers, all deſperate, and capable of any attempt. They croſſed the ſand; and having placed their ſcaling ladders, mounted one by one. As they came to the top they were diſpatched, each in turn, without noiſe, Montgomeri, who followed laſt, diſcovered the perfidy, and eſcaped with only two of his men, with whom he regained the Tombelaine. They preſerve with great care the ladders and grappling irons uſed on this occaſion. The count was at laſt beſieged and taken priſoner by the mareſhal de Matignon, in 1574, at Domfront, in Normandy; and Catharine de Medicis, who hated him for having been, though innocently, the cauſe of her huſband's death, cauſed him to be immediately executed.

†See France n° 140.

The church of Mount Michael is a great curioſity. It ſtands on nine pillars of moſt enormous dimenſions, built on the ſolid rock. Each of them appears to be about 25 feet in circumference: beſides theſe, there are two others much inferior in ſize, on which the centre of the church reſts, and over which is the tower. The following is the legendary account of the origin of this church: In the reign of Childebert II. there was a biſhop of Avranches named *St Aubert*. To this holy man the archangel Michael was pleaſed to appear one night, and ordered him to go to this rock to build a church. St Aubert treated this as a dream; upon which the angel appeared a ſecond time; and being ſtill diſobeyed, he returned a third time, when, by way of imprinting his command upon the ſaint's memory, he made a hole in his ſkull, by touching it with his thumb. The ſkull is ſtill preſerved in the treaſury of the church. It is incloſed in a little ſhrine of gold, and a cryſtal, which opens over the orifice, admits the gratification of curioſity by the minuteſt examination of it. The hole is of a ſize and ſhape proportionable to the thumb ſaid to have produced it; but it is impoſſible to determine whether it has been really made by a knife or any other way. It is not to be ſuppoſed that the ſaint would forget ſuch a ſenſible mark of the angel's diſpleaſure; he therefore immediately repaired to the rock, and conſtructed a ſmall church, as he had been commanded. Here, however, true hiſtory ſupplies the place of fable; and informs us, that it was in 966 when Richard the ſecond duke of Normandy began to build the abbey. It was completed about the year 1070, under William the Conqueror, though many other additions were made by ſucceeding abbots.

In the treaſury of the church are innumerable other relics; among which ſome few have a real and intrinſic value. There is a fine head of Charles VI. of France, cut in a cryſtal, and the repreſentation of a cockle ſhell in gold, weighing many pounds, given by Richard II. duke of Normandy, when he founded the abbey. There is an arm ſaid to belong to *St Richard* king of England; but who this ſaint was it muſt be very difficult to determine.

St MICHAEL'S, a borough town of Cornwal, between St Columb and Truro, 247 miles from London. Though one of the oldeſt boroughs in the county by perſcription, and of great note in the Saxons time, it is a mean hamlet in the pariſhes of Newland and St Enidore; yet it is governed by a portreeve, yearly choſen by a jury of the chief inhabitants, out of the ſix chief tenants, called deputy lords of the manor, becauſe they hold lands in the borough. Here is no market, but two fairs. A court-leet is held here twice a year. This place was formerly called Modiſhole, and afterwards Michel. Its liſt of members begins in the 6th of Edward VI.

St Michael's Mount, in the county of Cornwal, in the corner of Mount's-Bay is a very high rock, Michael's. only divided by the tide from the main-land, ſo that it is land and iſland twice a-day. The town here was burnt by the French in the reign of king Henry VIII. At the bottom of this mount, in digging for tin, there have been found ſpear-heads, battle axes, and ſwords, of braſs, all wrapt up in linen. The county is contracted here into a ſort of iſthmus ſo that it is ſcarce four miles between the Channel and the Severn ſea.— There have been large trees driven in by the ſea between this mount and Penzance.

MICHAELIS (John David), a celebrated biblical critic, and author of many eſteemed works, was the eldeſt ſon of Dr Chriſtian Benedict Michaelis, profeſſor in the univerſity of Halle in Lower Saxony, and was born at that place Feb. 27. 1717. His father devoted him at an early age to an academical life; and with that view he received the firſt part of his education in a celebrated Pruſſian ſeminary, called the *Orphan-houſe* at Glanche, in the neighbourhood of his native place. He commenced his academical career at Halle in 1733, and took his maſter's degree in the faculty of philoſophy in 1739. In 1741 he made an excurſion to Britain, where his ſuperior knowledge of the oriental languages, which was conſiderably increaſed by his indefatigable reſearches in the Bodleian library at Oxford, introduced him to the acquaintance, and gained him the eſteem, of the firſt literary characters; with ſeveral of whom and particularly biſhop Lowth, he was in correſpondence for many years. On his return to Halle, after an abſence of fifteen months, he began to read lectures on the hiſtorical books of the Old Teſtament, which he continued after his removal to Gottingen in 1745. In 1746 he was appointed profeſſor extraordinary, and ſoon after profeſſor of philoſophy in that univerſity. The next year he obtained a place of ſecretary to the royal ſociety there, of which he was director in 1761, and was ſoon afterwards made Aulic counſellor by the court of Hanover. In 1764 his diſtinguiſhed talents, but chiefly a publication relative to a journey to Arabia, which was undertaken by ſeveral literary men, at the expence of the king of Denmark, in conſequence of his application by means of Count Bernſdorff, procured him the honour of being choſen a correſpondent, and afterwards foreign member, of the academy of inſcriptions at Paris, of whom the inſtitution admitted only eight; and in the ſame year he became a member of the ſociety of Haarlem. In 1775, Count Hopkin, who eighteen years before had prohibited the uſe of his writings at Upſal, when he was chancellor of that univerſity, prevailed upon the king of Sweeden to confer on him the order of the polar ſtar, as a national compenſation. In 1786 he was raiſed to the diſtinguiſhed rank of privy counſellor of juſtice by the court of Hanover; and in 1788 received his laſt literary honour, by being unanimouſly elected a fellow of the royal ſociety of London.— His great critical knowledge of the Hebrew language, which he diſplayed in a new tranſlation of the Bible, and in other works, raiſed him to a degree of eminence almoſt unknown before in Germany; and his indefatigable labours were only equalled by his deſire of communicating the knowledge he acquired to the numerous ſtudents of all countries who frequented his admirable lectures, which he continued to deliver on various parts of the ſacred writings in half yearly courſes, and on the Hebrew, Arabic, and Syriac languages, to the laſt year of his life. He was profeſſor in the univerſity of Gottingen forty-five years, and, during that long period, he filled the chair with dignity, credit, and uſefulneſs. He died October 22. 1791, aged 74. He is ſaid to have left behind him ſeveral valuable MSS. Of the works that were publiſhed during his life-time, and which are very numerous, a catalogue, in the order of their publication, is given in the *Gentleman's Magazine* for march 1762.

Michaelmas, Mickle.

MICHAELMAS, or *Feaſt of St Michael and all Angels*, a feſtival of the Roman church, obſerved on the 29th of September. See MICHAEL.

MICKLE (William Julius), the celebrated tranſlator of the Luſiad, was the ſon of the reverend Alexander Mickle a Scottiſh clergyman, who had formerly been a diſſenting miniſter in London, an aſſiſtant to the reverend Dr Watts, and one of the tranſlators of Bayle's Dictionary. This gentlmen having reſided a few years in London, was preſented to the church of Langholm near Kelſo in Scotland, where he married; and our author was one of the younger ſons. He was born about the year 1735, and was educated by his father. In his early years his paſſion for poetry frequently diſcovered itſelf; though till the age of 13 he did not ſhow any particular attachment to books. At that time having accidentally met with Spencer's Fairy Queen, he became enamoured of his manner of writing, and inſtantly began to imitate him. After the death of his father, he came to Edinburgh to reſide with an uncle who was a brewer there, and who admitted him into a ſhare of his buſineſs; but not being qualified to ſucceed in this line, he went to London about the time of the concluſion of the war which began in 1755, with a view to procure a commiſſion in the marine ſervice. Here he was diſappointed; but introduced himſelf to the firſt Lord Lyttelton, to whom he ſent one of his poems. From his lordſhip, however, he received no other favour than being admitted to ſeveral interviews, and encouraged to perſevere in his poetical plans.

So cloſely did our author cultivate the ſtudy of the muſes, that before he was 18 years of age he had written two tragedies and half an epic poem; but all theſe were committed to the flames. The firſt of his poems which appeared in print was publiſhed in one of the Edinburgh magazines, and intitled, "On paſſing thro' the parliament Cloſe of Edinburgh at Midnight." This was afterwards inſerted in A collection of Original Poems by a Scotch gentleman, Vol. II. p. 137.

From the time of Mr Mickle's arrival at London till the year 1765, it is not known how he employed his time, though it is probable that he was employed in ſome branch of the printing buſineſs; and in 1765 he engaged himſelf as corrector to the Clarendon preſs. This year he publiſhed the poem which firſt brought him into notice, intitled, "Pollio, an Elegiac Ode, written in the Wood near R——(Roſlin) Caſtle," 4to. This was an elegy written on the death of his brother; which, previous to its publication, had been ſhown to Lord Lyttelton, and received ſome corrections from him. The latter, in an epiſtle to the author, ſpoke of it as equal to any thing of the kind in our language. In 1767 he publiſhed a poem called "The Concubine, in two Cantos, after the manner of Spencer,"

Spencer," 4to; and in 1769 he publiſhed, "A Letter to Mr Harwood, wherein ſome of his evaſive Gloſſes, falſe Tranſlations, and blundering Criticiſms, in ſupport of the Arian Hereſy, contained in his Literal Tranſlation of the New Teſtament, are pointed out and confuted," 8vo: and next year he publiſhed "Mary Queen of Scots, an elegy;" "Hengiſt and Mary a Ballad;" and "Knowledge, an Ode;" in Pearch's Collection of Poems. In 1770 he publiſhed "Voltaire in the Shades, or Dialogues on the Deiſtical Controverſy," 8vo. The Elegy on Mary had been ſubmitted to the judgment of Lord Lyttelton, who declined to criticiſe it, not for its deficiency in poetical merit, but from thinking differently from the author concerning that unfortunate princeſs.

About this time Mr Mickle was a frequent writer in the Whitehall Evening poſt; but a more important work now engaged his attention. When no more than 17 years of age he had read Caſtara's tranſlation of the Luſiad of Camoens into French, and then projected the deſign of giving an Engliſh tranſlation of it. From this, however, he was prevented by various avocations till the year 1771, when he publiſhed the firſt book as a ſpecimen: and having prepared himſelf by acquiring ſome knowledge of the Portugueſe language, he determined to apply himſelf entirely to this work. With this view he quitted his reſidence at Oxford, and went to a farm-houſe at Foreſt-hill, where he purſued his deſign with unremitting aſſiduity till the year 1775, when the work was entirely finiſhed,

During the time that Mr Mickle was engaged in this work he ſubſiſted entirely by his employment as corrector of the preſs; and on his quitting that employment he had only the ſubſcriptions he received for his tranſlation to ſupport him. Notwithſtanding theſe difficulties, he adhered ſteadily to the plan he had laid down and completed it in about five years.

When his work was finiſhed, Mr Mickle applied to a perſon of great rank, with whom his family had been connected, for permiſſion to dedicate it to him. Permiſſion was granted, and his patron honoured him with a very polite letter, but after receiving a copy, for which an extraordinary price was paid for the binding, he did not think proper to take any notice of the author. At laſt a gentleman of high rank in the political world, a firm friend to the author, and who afterwards took him under his protection, waited on the patron, and heard him declare that he had not read the work, but that it had been repreſented not to have the merit it was at firſt ſaid to poſſeſs. The applauſe with which the work was received, however, ſoon baniſhed from the author's mind thoſe diſagreeable ſenſations which had been occaſioned by the contemptuous neglect of his patron, as well as ſome ſevere criticiſms which had been circulated concerning it. A ſecond edition was prepared in 1778, with a plate prefixed to it, executed by the celebrated artiſt Mortimer; on whom Mr Mickle wrote an epitaph in 1779. This year alſo he publiſhed a pamphlet, intitled, "A Candid Examination of the reaſons for depriving the Eaſt India Company of its Charter, contained in The Hiſtory and Management of the Eaſt India Company from its Commencement to the Preſent Time; together with ſome Strictures on the Self-Contradictions and Hiſtorical Errors of Dr Adam Smith, in his Reaſons for the Abolition of the ſaid Company," 4to. About this time ſome of his friends thought of recommending him to the king as deſerving of a penſion; but this ſcheme was never put in execution. Dr Lowth, biſhop of London, would have put him into orders and provided for him in the church; but this was not agreeable to our author's diſpoſition. While he was meditating a publication of all his poems, in which he would moſt probably have found his account, he was appointed ſecretary to Commodore Johnſtone, who had lately obtained the command of the Romney man of war. In November 1779 he arrived at Liſbon, and was named by his patron joint agent for the prizes which were taken. In this capital and its neighbourhood he reſided more than ſix months, being every where received with every mark of politeneſs and attention; and during this period he compoſed his poem called "Almada Hill," which in 1781 was publiſhed in quarto. He collected alſo many particulars concerning the manners of the Portugueſe, which he intended alſo to have publiſhed. During his ſtay at Liſbon the royal academy was opened; and Mr Mickle, who was preſent at the ceremony of its commencement, had the honour to be admitted a member under the preſidency of Don John of Braganza duke of Lafoens. His preſence being thought neceſſary in England to attend to the proceedings of the courts of law reſpecting the condemnation of ſome of the prizes, he did not accompany the commodore in his laſt expedition, nor did he go any more to ſea. In 1782 he publiſhed "The Prophecy of Queen Emma, an ancient Ballad lately diſcovered, written by Johannes Turgottus, prior of Durham, in the reign of William Rufus; to which is added by the Editor, an Account of the Diſcovery, and Hints towards a Vindication of the Authenticity, of the Poems of Oſſian and Rowley," 8vo.

In June this year Mr Mickle married Miſs Tomkins, daughter of the perſon with whom he reſided at Foreſt-hill, while engaged in tranſlating the Luſiad. Having received ſome fortune with this lady, as well as made ſome money himſelf when in the ſervice of Commodore Johnſtone, he now enjoyed a comfortable independence. Having fixed his reſidence at Wheatley in Oxfordſhire, he devoted his time to the reviſion of his poetical works, which he propoſed to publiſh by ſubſcription; but the plan has not yet been carried into execution. The laſt ſeven years of his life were employed in writing for the European Magazine. The Fragments of Leo, and ſome of the moſt approved reviews of books, in that performance, were of his production. He died after a ſhort illneſs on the 25th of October 1788 at Wheatley, leaving one ſon behind him. His poetry poſſeſſes much beauty, variety, harmony of numbers, and vigour of imagination: his life was without reproach; his foibles were few and inoffenſive; his virtues many; and his genius very conſiderable.

MICROCOSM, a Greek term ſignifying the *little world;* uſed by ſome for *man*, as being ſuppoſed an epitome of the univerſe or great world.

MICROCOSMIC acid. See Phosphorus *(Acid of)*.

MICROGRAPHY, the deſcription of objects too minute to be viewed without the aſſiſtance of a microſcope. See *Microscopic Objects*,

MICROMETER, an inſtrument, by the help of which the apparent magnitudes of objects viewed thro' teleſcopes or microſcopes are meaſured with great exactneſs.

I. The firſt TELESCOPIC micrometers were only mechanical contrivances for meaſuring the image of an object in the focus of the object-glaſs. Before theſe contrivances were thought of, aſtronomers were accuſtomed to meaſure the field of view in each of their teleſcopes, by obſerving how much of the moon they could ſee through it, the ſemidiameter being reckoned at 15 or 16 minutes; and other diſtances were eſtimated by the eye, comparing them with the field of view. Mr Gaſcoigne, an Engliſh gentleman, however, fell upon a much more exact method, and had a Treatiſe on Optics prepared for the preſs; but he was killed during the civil wars in the ſervice of Charles I. and his manuſcript was never found. His inſtrument, however fell into the hands of Mr R. Townly who ſays, that by the help of it he could mark above 40,000 diviſions in a foot.

Mr Gaſcoigne's inſtrument being ſhown to Dr Hooke, he gave a drawing and deſcription of it, and propoſed ſeveral improvements in it, which may be ſeen in Phil. Tranſ. abr. Vol. I. p. 217. Mr Gaſcoigne divided the image of an object, in the focus of the object-glaſs, by the approach of two pieces of metal ground to a very fine edge, in the place of which Dr Hooke would ſubſtitute two fine hairs ſtretched parallel to one another. Two other methods of Dr Hooke's, different from this, are deſcribed in his Poſthumous Works, p. 497, 498. An account of ſeveral curious obſervations that Mr Gaſcoigne made by the help of his micrometer, particularly in the menſuration of the diameters of the moon and other planets, may be ſeen in the Phil. Tranſ. Vol. XLVIII. p. 190.

Mr Huygens, as appears by his Syſtem of Saturn, publiſhed in 1659, uſed to meaſure the apparent diameters of the planets, or any ſmall angles, by firſt meaſuring the quantity of the field of view in his teleſcope; which, he ſays, is beſt done by obſerving the time which a ſtar takes up in paſſing over it, and then preparing two or three long and ſlender braſs plates, of various breadths, the ſides of which were very ſtraight, and converging to a ſmall angle. In making uſe of theſe pieces of braſs, he made them ſlide in two ſlits, that were made in the ſides of the tube, oppoſite to the place of the image, and obſerved in what place it juſt covered the diameter of any planet, or any ſmall diſtance that he wanted to meaſure. It was obſerved, however, by Sir Iſaac Newton, that the diameters of planets, meaſured in this manner, will be larger than they ſhould be, as all lucid objects appear to be when they are viewed upon dark ones.

In the Ephemerides of the Marquis of Malvaſia publiſhed in 1662, it appears that he had a method of meaſuring ſmall diſtances between fixed ſtars and the diameters of the planets, and alſo of taking accurate draughts of the ſpots of the moon; and this was by a net of ſilver wire, fixed in the common focus of the object and eye-glaſs. He alſo contrived to make one of two ſtars to paſs along the threads of this net by turning it, or the teleſcope, as much as was neceſſary for that purpoſe; and he counted, by a pendulum-clock, beating ſeconds, the time that elapſed in its paſſage from one wire to another, which gave him the number of the minutes and ſeconds of a degree contained between the intervals of the wires of his net, with reſpect to the focal length of his teleſcope.

In 1666, Meſſrs Azout and Picard publiſhed a deſcription of a micrometer, which was nearly the ſame with that of the Marquis of Malvaſia, excepting the method of dividing it, which they performed with more exactneſs by a ſcrew. In ſome caſes they uſed threads of ſilk, as being finer than ſilver wires. Dechales alſo recommends a micrometer conſiſting of fine wires, or ſilken threads, the diſtances of which were exactly known, diſpoſed in the form of a net, as peculiarly convenient for taking a map of the moon.

M. de la Hire ſays, that there is no method more ſimple or commodious for obſerving the digits of an eclipſe than a net in the focus of the teleſcope. Theſe, he ſays, were generally made of ſilken threads; and that for this particular purpoſe ſix concentric circles had alſo been made uſe of, drawn upon oiled paper; but he adviſes to draw the circles on very thin pieces of glaſs with the point of a diamond. He alſo gives ſeveral particular directions to aſſiſt perſons in the uſe of them. In another memoir he ſhows a method of making uſe of the ſame net for all eclipſes, by uſing a teleſcope with two object-glaſſes, and placing them at different diſtances from one another.

Plate CCXCV. fig. 1.

Different Conſtructions of Micrometers. The firſt we ſhall deſcribe is that by Mr Huygens. Let ABCD be a ſection of the teleſcope at the principal focus of the object-glaſs, or where the wires are ſituated, which are placed in a ſhort tube containing the eye-glaſs, and may be turned into any poſition by turning that tube; mn is a fine wire extended over its centre; vw, xy, are two ſtraight plates whoſe edges are parallel and well defined, and perpendicular to mn; vw is fixed, and xy moves parallel to it by means of a ſcrew, which carries two indexes over a graduated plate, to ſhow the number of revolutions and parts of a revolution which it makes. Now to meaſure any angle, we muſt firſt aſcertain the number of revolutions and parts of a revolution correſponding to ſome known angle, which may be thus done: 1ſt, Bring the inner edges of the plates exactly to coincide, and ſet each index to 0; turn the ſcrew, and ſeparate the plates to any diſtance; and obſerve the time a ſtar m is in paſſing along the wire mn from one plate to the other: for that time, turned into minutes and ſeconds of a degree, will be the angle anſwering to the number of revolutions, or the angle correſponding to the diſtance. Thus, if d=coſ. of the ſtar's declination, we have $15' dm$, the angle correſponding to the diſtance; and hence by proportion, we find the angle anſwerring to any other. 2*dly*, Set up an object of a known diameter, or two objects at a given diſtance, and turn the ſcrew till the edges of the plates become tangents to the object, or till their opening juſt takes in the diſtance of the two objects upon the wire mn; then from the diamater, or diſtance of the two objects from each other, and their diſtance from the glaſs, calculate the angle, and obſerve the number of revolutions and parts correſponding. 3*dly*, Take the diameter of the ſun on any day, by making the edges of the plates tangents to the oppoſite limbs, and find, from

MICROMETER

Plate CCXCV

Fig. 1.

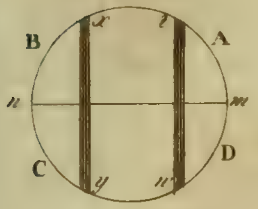


Fig. 3.

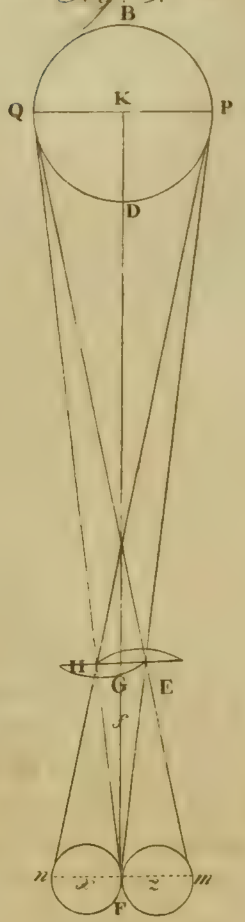
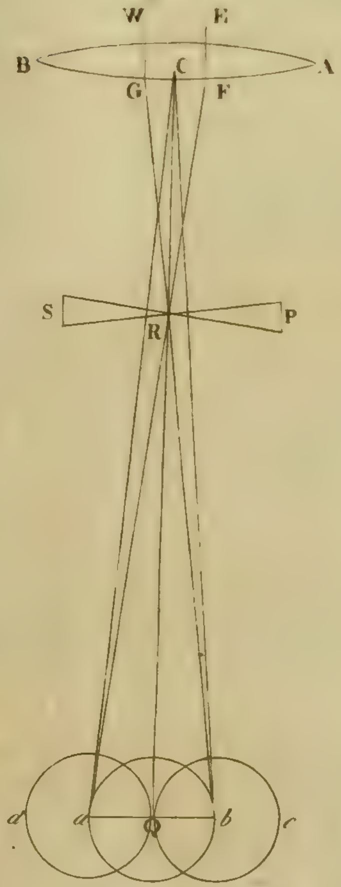


Fig. 8.



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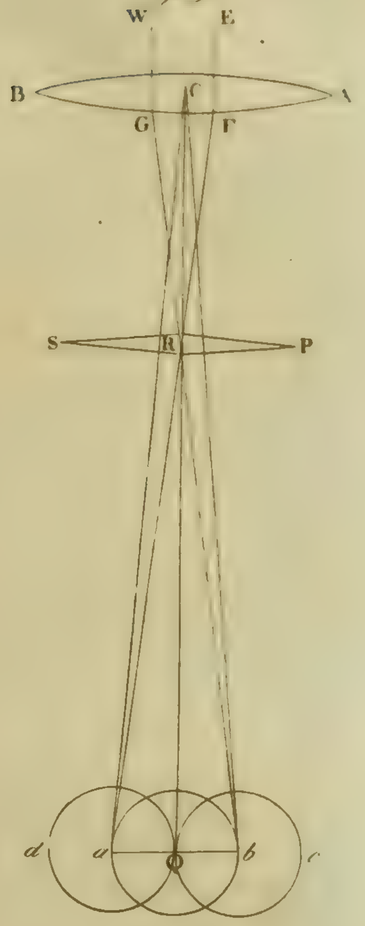

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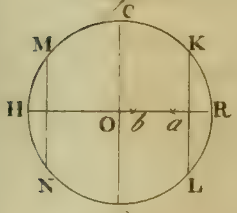

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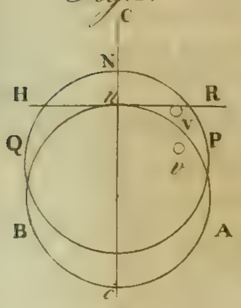
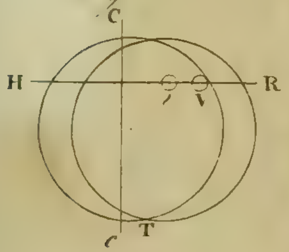


Fig. 6.



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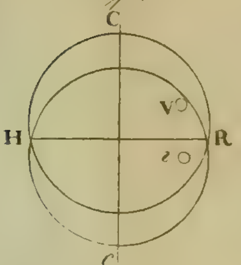


Fig. 10.

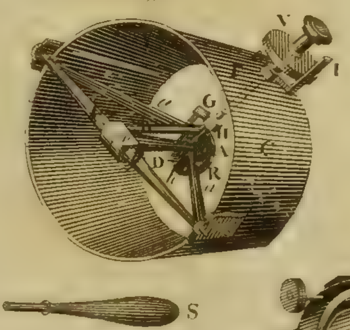
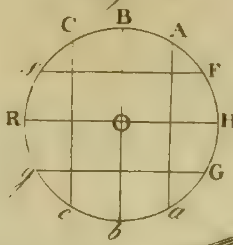


Fig. 2.



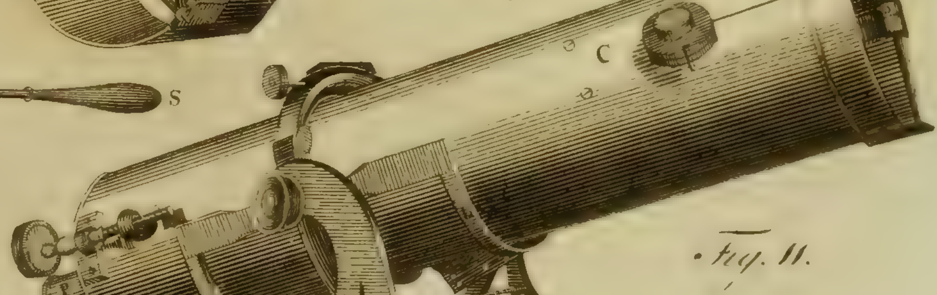


Fig. 11.

Trenchard

Micrometer.

ſrom the nautical almanac, what is his diameter on that day. Here it will be beſt to take the upper and lower limbs of the ſun when on the meridian, as he has then no motion perpendicular to the horizon. If the edges do not coincide when the indexes ſtand at 0, we muſt allow for the error. Inſtead of making a proportion, it is better to have a table calculated to ſhow the angle correſponding to every revolution and parts of a revolution. But the obſerver muſt remember, that when the micrometer is fixed to teleſcopes of different focal lengths, a new table muſt be made. The whole ſyſtem of wires is turned about in its own plane, by turning the eye-tube round with a hand, and by that means the wire *m n* can be thrown into any poſition, and conſequently angles in any poſition may be meaſured. Dr Bradley added a ſmall motion by a rack and pinion to ſet the wires more accurately in any poſition.

Inſtead of two plates, two wires were afterwards put; and Sir Iſaac Newton obſerved, that the diameters of the planets meaſured by the plates were ſomewhat bigger than they ought, as appeared by comparing Mr Huygens's meaſures with others taken with the wires; and alſo by comparing the diameter of mercury obſerved in and out of the ſun's diſk, the latter being the greateſt. Dark objects on bright ones appear leſs, and light objects on dark ones appear greater, than if they were equally bright; owing, perhaps, to the brighter image on the retina diffuſing itſelf into the darker: and the bright image of the planet being intercepted by the plates, the faint diffuſed light becomes more ſenſible, and is miſtaken for the edge of the planet.

But the micrometer, as now contrived, is of uſe, not only to find the angular diſtance of bodies in the field of view at the ſame time, but alſo of thoſe which, when the teleſcope is fixed, paſs through the field of view ſucceſſively; by which means we can find the difference of their right aſcenſions and declinations.

Fig. 2. Let A *a*, B *b*, C *c*, be three parallel and equidiſtant wires, the middle one biſecting the field of view; H O R a fixed wire perpendicular to them paſſing through the centre of the field; and F *f*, G *g*, two wires parallel to it, each moveable by a micrometer ſcrew, as before, ſo that they can be brought up to H O R, or a little beyond. Then to find the angular diſtance of two objects, bring them very near to B*b*, and in a line parallel to it, by turning about the wires, and bring one upon H O R, and by the micrometer ſcrew make F *f* or G *g* paſs through the other; then turn the ſcrew till that wire coincides with H O R, and the arc which the index has paſſed over ſhows their angular diſtance. If the objects be further remote than you can carry the diſtance of one of the wires F *f*, G *g*, from H O R, then bring one object to F *f* and the other to G *g*; and turn each micrometer ſcrew till they meet, and the ſum of the arcs paſſed over by each index gives their angular diſtance. If the objects be two ſtars, and one of them be made to run along H O R, or either of the moveable wires as occaſion may require, the motion of the other will be parallel to theſe wires, and their difference of declinations may be obſerved with great exactneſs; but in taking any other diſtances, the motion of the ſtars being oblique to theſe, it is not quite ſo eaſy to get them parallel to B *b*; becauſe if one ſtar be brought near, and the eye be applied to the other to adjuſt the wires to it, the former ſtar will have gone a little away from the wire. Dr Bradley, in his account of the uſe of this micrometer, publiſhed by Dr Maſkelyne in the Philoſophical Tranſactions for 1772, thinks the beſt way is to move the eye backwards and forwards as quick as poſſible; but it ſeems to me to be beſt to fix the eye on ſome point between, by which means it takes in both at once ſufficiently well defined to compare them with B *b*. In finding the difference of declinations, if both bodies do not come into the field of view at the ſame time, make one run along the wire H O R, as before, and fix the teleſcope and wait till the other comes in, and then adjuſt one of the moveable wires to it, and bring it up to H O R, and the index gives the difference of their declinations. The difference of time between the paſſage of the ſtar at either of the croſs moveable wires, and the tranſit of the other ſtar over the croſs fixed wire (which repreſents a meridian), turned into degrees and minutes, will give the difference of right aſcenſion. The ſtar has been here ſuppoſed to be biſected by the wire; but if the wire be a tangent to it, allowance muſt be made for the breadth of the wire, provided the adjuſtment be made for the coincidence of the wires. In obſerving the diameters of the ſun, moon, or planets, it may perhaps be moſt convenient to make uſe of the outer edges of the wires, becauſe they appear moſt diſtinct when quite within the limb: but if there ſhould be any ſenſible inflection of the rays of light in paſſing by the wires, it will be beſt avoided by uſing the inner edge of one wire and the outward edge of the other; for by that means the inflection at both limbs will be the ſame way, and therefore there will be no alteration of the relative poſition of the rays paſſing by each wire. And it will be convenient in the micrometer to note at what diviſion the index ſtands when the moveable wire coincides with H O R; for then you need not bring the wire when a ſtar is upon it up to H O R, only reckon from the diviſion at which the index then ſtands to the above diviſion.

With a micrometer therefore thus adapted to a teleſcope, Mr Servington Savery of Exeter propoſed a new way of meaſuring the difference between the greateſt and leaſt apparent diameters of the ſun, although the whole of the ſun was not viſible in the field of view at once. The method we ſhall briefly deſcribe. Place two object-glaſſes inſtead of one, ſo as to form two images whoſe limbs ſhall be at a ſmall diſtance from each other; or inſtead of two perfect lenſes, he propoſed to cut a ſingle lens into four parts of equal breadths by parallel lines, and to place the two ſegments with their ſtraight ſides againſt each other, or the two middle fruſtrums with their oppoſite edges together; in either caſe, the two parts which before had a common centre and axis, have now their centres and axes ſeparated, and conſequently two images will be formed as before by two perfect lenſes. Another method in reflectors was to cut the large concave reflector through the centre, and by a contrivance to turn up the outer edges whilſt the ſtraight ones remained fixed; by which means the axis of the two parts became inclined, and formed two images. Two images being formed in this manner, he propoſed to meaſure the diſtance between the limbs when the diameters of the ſun were the greateſt and leaſt, the difference of which would be the difference of the diameters required. Thus far we are indebted to Mr Savery for the idea of forming two images; and the admirable uſe to which it was afterwards applied, we ſhall next proceed to deſcribe.

The divided object-glaſs micrometer, as now made, was contrived by the late Mr John Dollond, and by him adapted to the object-end of a reflecting teleſcope, and has been ſince by the preſent Mr P. Dollond his ſon applied with equal advantage to the end of an achromatic teleſcope. The principle is this: The object-glaſs is divided into two ſegments in a line drawn through the centre; each ſegment is fixed in a ſeparate frame of braſs which is moveable, ſo that the centres of the two ſegments may be brought together by a handle for that purpoſe, and thereby form one image of an object; but when ſeparated they will form two images, lying in a line paſſing through the centre of each ſegment; and conſequently the motion of each image will be parallel to that line, which can be thrown into any poſition by the contrivance of another handle to turn the glaſs about in its own plane. The braſs-work carries a vernier to meaſure the diſtance of the centres of the two ſegments. Now let E and H be the centres of the two ſegments, F their principal focus, and P Q two diſtant objects in FE, FH, produced, or the oppoſite limbs of the ſame object PBQD; then the images of P and Q formed by each ſegment, or the images of the oppoſite limbs of the object PBQD, coincide at F: hence two images mzF, nxF of that object are formed, whoſe limbs are in contact; therefore the angular diſtance of the points P and Q is the ſame as the angle which the diſtance EH ſubtends at F, which, as the angles ſuppoſed to be meaſured are very ſmall, will vary as EH extremely nearly; and conſequently if the angle correſponding to one interval of the centres of the ſegments be known, the angle correſponding to any other will be found by proportion. Now to find the interval for ſome one angle, take the horizontal diameter of the ſun on any day, by ſeparating the images till the contrary limbs coincide, and read off by the vernier the interval of their centres, and look into the nautical almanac for the diameter of the ſun on that day, and you have the correſponding angle. Or if greater exactneſs be required than from taking the angle in proportion to the diſtances of their centres, we may proceed thus:—Draw FG perpendicular to EH, which therefore biſects it; then one half EH, or EG, is the tangent of half the angle EFH; hence, half the diſtance of their centres: tangent of half the angle correſponding to that diſtance :: half any other diſtance of the centres: tangent of half the correſponding angle (A).

Fig. 3.

Hence the method of meaſuring ſmall angles is manifeſt; for we conſider P, Q, either as two objects whoſe images are brought together by ſeparating the two ſegments, or as the oppoſite limbs of one object PBQA, whoſe images, formed by the two ſegments E, H, touch at F: in the former caſe, EH gives the angular diſtance of the two objects; and in the latter, it gives the angle under which the diameter of the object appears. Hence, to find the angular diſtance of two objects, ſeparate the ſegments till the two images which approach (B) each other coincide; and to find the diameter of an object, ſeparate the ſegments till the contrary limbs of the images touch each other, and read off the diſtance of the centres of the ſegments from the vernier (C), and find the angle as directed in the laſt article. From hence appears one great ſuperiority in this above the wire micrometer; as, with this, any diameter of an object may be meaſured with the ſame eaſe and accuracy; whereas with that we cannot with accuracy meaſure any diameter, except that which is at right angles to its apparent motion.

But, beſides theſe two uſes to which the inſtrument ſeems ſo well adapted, Dr Maſkelyne has ſhown, in the Philoſophical Tranſactions for the year 1771, how it may be applied to find the difference of right aſcenſions and declinations. For this purpoſe, two wires at right angles to each other, biſecting the field of view muſt be placed in the principal focus of the eye-glaſs, and moveable about in their own plane.—Let

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(A) If the object be not a diſtant one, let f be the principal focus; then $Ff : FG :: FG : FK$ (FG being produced to meet a line joining the apparent places of the two objects P, Q), ∴ dividendo, $fG : FG :: GK : FK$, and alternando, $fG : GK :: FG : FK ::$ (by ſimilar triangles) $EH : PQ$, hence $\frac{EH}{fG}=\frac{PQ}{GK}$, therefore the angle ſubtended by EH at $f =$ the angle ſubtended by PQ at G; and conſequently, as G is conſtant, the angle meaſured at G is, in this caſe alſo in proportion to EH. The inſtrument is not adapted to meaſure the angular diſtance of bodies, one of which is near and the other at a diſtance, becauſe their images would not be formed together.

(B) Beſides theſe two images, there will be two others receding from each other, for each ſegment gives an image of each object.

(C) To determine whether there be any error of adjuſtment of the micrometer ſcale, meaſure the diameter of any ſmall well defined object, as Jupiter's equatorial diameter, or the longeſt axis of Saturn's ring, both ways, that is, with 0 on the vernier to the right and left of 0 on the ſcale, and half the difference is the error required; which muſt be added to or ſubtracted from all obſervations, according as the diameter meaſured with 0 on the vernier, when advanced on the ſcale, is leſs or greater than the diameter meaſured the other way. And it is alſo evident, that half the ſum of the diameters thus meaſured gives the true diameter of the object.

Fig. 4.

Let HCR*c* be the field of view, HR and C*c* the two wires; turn the wires till the weſternmoſt ſtar (which is the beſt, having farther to move) run along ROH; then ſeparate the two ſegments and turn about the micrometer till the two images of the ſame ſtar lie in the wire C*c*; and then, partly by ſeparating the ſegments, and partly by raiſing or depreſſing the teleſcope, bring the two innermoſt images of the two ſtars to appear and run along ROH, as *a*, *b*, and the vernier will give the difference of their declinations; becauſe, as the two images of one of the ſtars coincided with C*c*, the image of each ſtar was brought perpendicularly upon HR, or to HR in their proper meridian. And, for the ſame reaſon, the difference of their times of paſſing the wire CO*c* will give their difference of right aſcenſions. Theſe operations will be facilitated, if the teleſcope be mounted on a polar axis. If two other wires KL, MN, parallel to C*c*, be placed near H and R, the obſervation may be made on two ſtars whoſe difference of meridians is nearly equal to HR the diameter of the field of view, by bringing the two images of one of the ſtars to coincide with one of theſe wires. If two ſtars be obſerved whoſe difference of declinations is well ſettled, the ſcale of the micrometer will be known.

It has hitherto been ſuppoſed, that the images of the two ſtars can be both brought into the field of view at once upon the wire HOR: but if they cannot, ſet the micrometer to the difference of their declinations as nearly as you can, and make the image which comes firſt run along the wire HOR, by elevating or depreſſing the teleſcopes; and when the other ſtar comes in, if it do not alſo run along HOR, alter the micrometer till it does, and half the ſum of the numbers ſhown by the micrometer at the two ſeparate obſervations of the two ſtars on the wire HOR will be the difference of their declinations. That this ſhould be true, it is manifeſtly neceſſary that the two ſegments ſhould recede equally in oppoſite directions; and this is effected by Mr Dollond in his new improvement of the object-glaſs micrometer.

Fig. 5.

The difference of right aſcenſions and declinations of Venus or Mercury in the ſun's diſk and the ſun's limb may be thus found. Turn the wires ſo that the north limb *n* of the ſun's image AB, or the north limb of the image N of the planet, may run along the wire RH, which therefore will then be parallel to the equator, and conſequently C*c* a ſecondary to it; then ſeparate the ſegments, and turn about the micrometer till the two images V*v* of the planet paſs C*c* at the ſame time, and then by ſeparating the ſegments, bring the north limb of the northermoſt image V of the planet to touch HR, at the time the northernmoſt limb *n* of the ſouthernmoſt image AB of the ſun touches it, and the micrometer ſhows the difference of declinations of the northernmoſt limbs of the planet and ſun, for the reaſon formerly given †, we having brought the northernmoſt limbs of the two innermoſt, images V and AB to HR, theſe two being manifeſtly interior to *v* and the northernmoſt limb N of the image PQ. In the ſame manner we take the difference of declinations of their ſouthernmoſt limbs; and half the difference of the two meaſures, (taking immediately one after another) is equal to the difference of the declinations of their centres, without any regard to the ſun's or planet's diameters, or error of adjuſtment of the micrometer; for as it affects both equally, the difference is the ſame as if there were no error: and the difference of the times of the tranſits of the eaſtern or weſtern limbs of the ſun and planet over C *c* gives the difference of their right aſcenſions.

† See the preceding page col. 2. par. 2,

Fig. 6.

Inſtead of the difference of right aſcenſions, the diſtance of the planet from the ſun's limb, in lines parallel to the equator, may be more accurately obſerved thus: Separate the ſegments, and turn about the wires and micrometer, ſo as to make both images V, *v*, run along HR, or ſo that the two interſections I, T, of the ſun's image may paſs C*c* at the ſame time. Then bring the planet's and ſun's limbs into contact, as at V, and do the ſame for the other limb of the ſun, and half the difference gives the diſtance of the centre of the planet from the middle of the chord on the ſun's diſk parallel to the equator, or the difference of the right aſcenſions of their centres, allowing for the motion of the planet in the interval of the obſervations, without any regard to the error of adjuſtment, for the ſame reaſon as before. For if you take any point in the chord of a circle, half the difference of the two ſegments is manifeſtly the diſtance of the point from the middle of the chord; and as the planet runs along HR, the chord is parallel to the equator.

Fig. 7.

In like manner, the diſtances of their limbs may be meaſured in lines perpendicular to the equator, by bringing the micrometer into the poſition already deſcribed*, and inſtead of bringing V to HR, ſeparate the ſegments till the northernmoſt limbs coincide as at V; and in the ſame manner make their ſouthernmoſt images to coincide, and half the difference of the two meaſures, allowing for the planet's motion, gives the difference of the declinations of their centres.

* See the preceding column, par. 3.

Hence the true place of a planet in the ſun's diſk may at any time of its tranſit be found; and conſequently the neareſt approach to the centre and the time of ecliptic conjunction may be deduced, although the middle ſhould not be obſerved.

But however valuable the object-glaſs micrometer undoubtedly is, difficulties ſometimes have been found in its uſe, owing to the alteration of the focus of the eye, which will cauſe it to give different meaſures of the ſame angle at different times. For inſtance, in meaſuring the ſun's diameter, the axis of the pencil coming through the two ſegments from the contrary limbs of the ſun, as PF, QF, fig. 3. croſſing one another in the focus F under an angle equal to the ſun's ſemidiameter, the union of the limbs cannot appear perfect, unleſs the eye be diſpoſed to ſee objects diſtinctly at the place where the images are formed; for if the eye be diſpoſed to ſee objects nearer to or further off than that place, in the latter caſe the limbs will appear ſeparated, and the former they will appear to lap over (D). This imperfection led Dr Ma-

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(D) For if the eye can ſee diſtinctly an image at F, the pencils of rays, of which PF, QF are the two axes, diverging from F, are each brought to the focus on the retina at the ſame point; and therefore the two limbs led me to inquire, whether some method might not be found of producing two distinct images of the ſun or any other object, by bringing the axis of each pencil to coincide, or very nearly ſo before the formation of the images, by which means the limbs when brought together would not be liable to appear ſeparated from any alteration of the eye; and this he found would be effected by the refraction of two priſms, placed either without or within the teleſcope; and on this principle, placing the priſms within, he conſtructed a new micrometer, and had one executed by Mr Dollond which upon trial anſwered as he expected. The conſtruction is as follows.

Fig. 8, 9.

Let AB be the object glaſs; *ab* the image, ſuppoſe of the ſun, which would have been formed in the principal focus Q; but let the priſms PR, SR be placed to intercept the rays, and let EF, WG, be two rays proceeding from the eaſtern and weſtern limbs of the ſun, converging, after refraction at the lens, to *a* and *b*; and ſuppoſe the refraction of the priſms to be ſuch, that in fig. 8, the ray EFR, after refraction at R by the priſm PR, may proceed in the direction RQ; and as all the rays which were proceeding to *a* ſuffer the ſame refraction at the priſm, they will all be refracted to Q; and therefore inſtead of an image *ab*, which would have been formed by the lens alone, an image Q*c* is formed by thoſe rays which fall on the priſm PR; and for the ſame reaſon the rays falling on the priſm SR will form an image Q*d*: and in fig. 9. the image of the point *b* is brought to Q, by the priſm PR; and conſequently an image Q *d* is formed by thoſe rays which fall on PR: and for the ſame reaſon, an image Q *c* is formed by the rays falling on SR. Now in both caſes, as the rays EFR, WGR, coming from the two oppoſite limbs of the ſun, and forming the point of contact of the two limbs, proceed in the ſame direction RQ, they muſt thus accompany each other through the eye glaſs and alſo through the eye, whatever refractive power it has, and therefore to every eye the images muſt appear to touch. Now the angle *a*R*b* is twice the refraction of the priſm, and the angle *a*C*b* is the diameter of the ſun; and as theſe angles are very ſmall, and have the ſame ſubtenſe *ab*, we have the angle *a*R*b* : angle *a*C*b* : : CQ : RQ.— Now as CQ is conſtant, and alſo the angle *a*R*b*, being twice the refraction of the priſm, the angle *a*C*b*, varies as RQ. Hence the extent of the ſcale for meaſuring angles becomes the focal length of the object glaſs, and the angle meaſured is in proportion to the diſtance of the priſms from the principal focus of the object glaſs; and the micrometer can meaſure all angles (very ſmall ones excepted, for the reaſon afterwards given *) which do not not exceed the ſum of the refraction of the priſms; for the angle *a*C*b*, the diameter of the object to be meaſured, is always *leſs* than the angle *a*R*b*, the ſum of the refractions of the priſms, except when the priſms touch the object glaſs, and then they become *equal*. The ſcale can never be out of adjuſtment, as the point o where the meaſurement begins anſwers to the focus of the object glaſs, which is a fixed point for all diſtant objects, and we have only to find the value of the ſcale anſwering to ſome known angle: for inſtance, bring the two limbs of the ſun's images into contact, and meaſure the diſtance of the priſms from the focus, and look in the nautical almanac for the ſun's diameter, and you get the value of the ſcale.

* Next col. par. 1 ſt.

In fig. 8. the limb Q, of the image Q*c*, is illuminated by the rays falling on the object glaſs between A and F, and of the image Q*d* by thoſe falling between B and G; but in fig. 9. the ſame limbs are illuminated by the rays falling between B and F, A and G reſpectively, and therefore will be more illuminated than in the other caſe; but the difference is not conſiderable in achromatic teleſcopes, on account of the great aperture of the object-glaſs compared with the diſtance FG.

It might be convenient to have two ſets of priſms, one for meaſuring angles not exceeding 3′, and therefore fit for meaſuring the diameters of the ſun and moon, and the lucid parts and diſtances of the cuſps in their eclipſes; and another for meaſuring angles not much greater than 1′, for the conveniency of meaſuring the diameter of the planets. For as QC : QR : : ſum of the refractions of the priſms : angle *a*C*b*, the apparent diameter of the object, it is evident that if you diminiſh the third term, you muſt increaſe the ſecond in the ſame ratio, in order to meaſure the ſame angle; and thus by diminiſhing the refractive angle of the priſms, you throw them farther from Q, and conſequently avoid the inconvenience of bringing them near to Q, for the reaſon in the next paragraph; and at the ſame time you will increaſe the illumination in a ſmall degree. The priſms muſt be achromatic, each compoſed of two priſms of flint and crown glaſs, placed with their refracting angles contrariways, otherwiſe the images will be coloured.

In the conſtruction here deſcribed, the angle meaſured becomes evaneſcent when the priſms come to the principal focus of the object glaſs, and therefore o on the ſcale then begins: but if the priſms be placed in the principal focus they can have no effect, becauſe the pencil of rays at the junction of the priſms would then vaniſh, and therefore it is not practicable to bring the two images together to get o on the ſcale. Dr Maſkelyne, therefore, thought of placing another pair of priſms within, to refract the rays *before* they came to the other priſms, by which means the two images would be formed into one before they came to the principal focus, and therefore o on the ſcale could be determined. But to avoid the error ariſing from the multiplication of medium, he, inſtead of adding another pair of priſms, divided the object glaſs through its centre, and ſliding the ſegments a little it ſeparated the images, and then by the priſms he could form one image very diſtinctly, and conſequently could determine o on the ſcale; for by ſeparating the two ſegments you form two images, and you will ſeparate the two pencils ſo that you may move up the two priſms, and the two pencils will fall on each reſpectively, and the two images may be formed into one. In the inſtrument which Dr Maſkelyne had made, o on the ſcale was choſen to be about $\frac{2}{3}$ of the focal length of the object-glaſs,

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appear to coincide: but if we increaſe the refractive power of the eye, then each pencil is brought to a focus, and they croſs each other before the rays come to the retina, conſequently the two limbs on the retina will lap over; and if we diminiſh the refractive power of the eye, then each pencil being brought to a focus beyond the retina, and not croſſing till after they have paſſed through it, the two limbs on the retina muſt be ſeparated.

glaſs, and each priſm refracted 27′. By this means all angles are meaſured down to 0.

In the Philoſophical Tranſactions for 1779, Mr Ramſden has deſcribed two new micrometers, which he contrived with a view of remedying the defects of the object-glaſs micrometer.

1. One of theſe is a *catoptric* micrometer, which beſide the advantage it derives from the principle of reflection, of not being diſturbed by the heterogeneity of light, avoids every defect of other micrometers, and can have no aberration, nor any defect ariſing from the imperfection of materials or of execution; as the extreme ſimplicity of its conſtruction requires no additional mirrors or glaſſes to thoſe required for the teleſcope; and the ſeparation of the image being effected by the inclination of the two ſpecula, and not depending on the focus of any lens or mirror, any alteration in the eye of an obſerver cannot affect the angle meaſured. It has peculiar to itſelf the advantages of an adjuſtment, to make the images coincide in a direction perpendicular to that of their motion; and alſo of meaſuring the diameter of a planet on both ſides of the zero, which will appear no inconſiderable advantage to obſervers who know how much eaſier it is to aſcertain the contact of the external edges of two images than their perfect coincidence.

Fig. 10.

A repreſents the ſmall ſpeculum divided into two equal parts; one of which is fixed on the end of the arm B; the other end of the arm is fixed on a ſteel axis X, which croſſes the end of the teleſcope C. The other half of the mirror A is fixed on the arm D, which arm at the other end terminates in a ſocket *y*, that turns on the axis X; both arms are prevented from bending by the braces *a a*. G repreſents a double ſcrew, having one part *e* cut into double the number of threads in an inch to that of the part *g*: the part *e* having 100 threads in one inch, and the part *g* 50 only. The ſcrew *e* works in a nut F in the ſide of the teleſcope, while the part *g* turns in a nut H, which is attached to the arm B; the ends of the arms B and D, to which the mirrors are fixed, are ſeparated from each other by the point of the double ſcrew preſſing againſt the ſtud *h*, fixed to the arm D, and turning in the nut H on the arm B. The two arms B and D are preſſed againſt the direction of the double ſcrew *e g* by a ſpiral ſpring within the part *n*, by which means all ſhake or play in the nut H, on which the meaſure depends, is entirely prevented.

From the difference of the threads on the ſcrew at *e* and *g*, it is evident, that the progreſſive motion of the ſcrew through the nut will be half the diſtance of the ſeparation of the two halves of the mirror; and conſequently the half mirrors will be moved equally in contrary directions from the axis of the teleſcope C.

The wheel V fixed on the end of the double ſcrew has its circumference divided into 100 equal parts, and numbered at every fifth diviſion with 5, 10, &c. to 100. and the index I ſhows the motion of the ſcrew with the wheel round its axis, while the number of revolutions of the ſcrew is ſhown by the divſions on the ſame index. The ſteel ſcrew at R may be turned by the key S, and ſerves to incline the ſmall mirror at right angles to the direction of its motion. By turning the finger-head T (fig. 11.), the eye-tube P is brought nearer or farther from the ſmall mirror, to adjuſt the teleſcope to diſtinct viſion; and the teleſcope itſelf hath a motion round its axis, for the convenience of meaſuring the diameter of a planet in any direction. The inclination of the diameter meaſured with the horizon is ſhown in degrees and minutes by a level and vernier on a graduated circle, at the breech of the teleſcope.

"It is neceſſary to obſerve (ſays Mr Ramſden), that, beſides the table for reducing the revolutions and parts of the ſcrew to minutes, ſeconds, &c. it may require a table for correcting a very ſmall error which ariſes from the excentric motion of the half-mirrors. By this motion their centres of curvature will (when the angle to be meaſured is large) approach a little towards the large mirror: the equation for this purpoſe in ſmall angles is inſenſible; but when angles to be meaſured exceed ten minutes, it ſhould not be neglected. Or, the angle meaſured may be corrected by diminiſhing it in the proportion the verſed ſine of the angle meaſured, ſuppoſing the eccentricity radius, bears to the focal length of the ſmall mirror."

Mr Ramſden preferred Caſſegrain's conſtruction of the reflecting teleſcope to either the Gregorian or Newtonian, becauſe in the former, errors cauſed by one ſpeculum are diminiſhed by thoſe in the other. From a property of the reflecting teleſcope (which, he obſerves, has not been attended to), that the apertures of the two ſpecula are to each other very nearly in the proportion of their focal lengths, it follows that their abberrations will be to each other in the ſame proportion; and theſe abberations in the ſame direction, if the two ſpecula are both concave; or in contrary directions, if one ſpeculum is concave and the other convex. In the Gregorian conſtruction both ſpecula being concave, the aberration at the ſecond image will be the ſum of the abberrations of the two mirrors; but in the Caſſegrain conſtruction, one mirror being concave and the other convex, the abberration at the ſecond image will be the difference between their abberrations. By aſſuming ſuch proportions for the *foci* of the ſpecula as are generally uſed in the reflecting teleſcope, which is about as 1 to 4, the abberration in the Caſſegrain conſtruction will be to that in the Gregorian as 3 to 5.

2. The other is a *dioptric* micrometer, or one ſuited to the principles of refraction. This micrometer is applied to the erect eye-tube of a refracting teleſcope, and is placed in the conjugate focus of the firſt eye-glaſs: in which poſition, the image being conſiderably magnified before it comes to the micrometer, any imperfection in its glaſs will be magnified only by the remaining eye-glaſſes, which in any teleſcope ſeldom exceeds five or ſix times. By this poſition alſo the ſize of the micrometer glaſs will not be the [illegible] part of the area which would be required if it was placed in the object-glaſs; and, notwithſtanding this great diſproportion of ſize, which is of great moment to the practical optician, the ſame extent of ſcale is preſerved, and the images are uniformly bright in every part of the field of the teleſcope.

Plate CCXCVI.

Fig. 12. repreſents the glaſſes of a refracting teleſcope; *vv*, the principal pencil of rays from the object-glaſs O; *t t* and *u u*, the axis of two oblique pencils; *u*, the firſt eye-glaſs; *m*, its conjugate focus, or the place of the micrometer; *b* the ſecond eye-glaſs; *c* the third; and *d* the fourth, or that which is neareſt the eye. Let *p* be the diameter of the object-glaſs, *e* the diameter of a pencil at *m*, and *f* the diameter of the pencil at the eye; it is evident, that the axis of the pencils from every part of the image will croſs each other at the point *m*; and *e*, the width of the micrometer-glaſs, is to *p* the diameter of the object glaſs as *m a* is to *g o*, which is the proportion of the magnifying power at the point *m*; and the error cauſed by an imperfection in the micrometer glaſs placed at *m* will be to the error, had the micrometer been at O, as *m* is to *p*.

Fig. 13. repreſents the micrometer: A, a convex or concave lens divided into two equal parts by a plane acroſs its centre; one of theſe ſemilenſes is fixed in a frame B, and the other in the frame E; which two frames ſlide on a plate H, and are preſſed againſt it by thin plates *a a*: the frames B and E are moved in contrary directions by turning the button D; L is a ſcale of equal parts on the frame B; it is numbered from each end towards the middle with 10, 20, &c. There are two verniers on the frame E, one at M and the other at N, for the convenience of meaſuring the diameter of a planet, &c. on both ſides the zero. The firſt diviſion on both of theſe verniers coincides at the ſame time with the two zeros on the ſcale L; and if the frame is moved towards the right, the relative motion of the two frames is ſhown on the ſcale L by the vernier M; but if the frame B be moved towards the left, the relative motion is ſhown by the vernier N.—This micrometer has a motion round the axis of viſion, for the convenience of meaſuring the diameter of a planet, &c. in any direction, by turning an endleſs ſcrew F; and the inclination of the diameter meaſured with the horizon is ſhown on the circle *g* by a vernier on the plate V. The teleſcope may be adjuſted to diſtinct viſion by means of an adjuſting ſcrew, which moves the whole eye-tube with the micrometer nearer or farther from the object-glaſs, as teleſcopes are generally made; or the ſame effect may be produced in a better manner, without moving the micrometer, by ſliding the part of the eye tube *m* on the part *n*, by help of a ſcrew or pinion. The micrometer is made to take off occaſionally from the eye tube, that the teleſcope may be uſed without it.

Still, however micrometers remained in ſeveral reſpects imperfect. In particular, the imperfections of the parallel-wire micrometer in taking the diſtance of very cloſe double ſtars, are the following.

When two ſtars are taken between the parallels, the diameters muſt be included. Mr Herſchel informs us, he has in vain attempted to find lines ſufficiently thin to extend them acroſs the centres of the ſtars ſo that their thickneſs might be neglected. The ſingle threads of the ſilk worm, with ſuch lenſes as he uſes, are ſo much magnified that their diameter is more than that of many of the ſtars. Beſides, if they were much leſs than they are the power of deflection of light would make the attempt to meaſure the diſtance of the centres this way fruitleſs: for he has always found the light of the ſtars to play upon thoſe lines and ſeparate their apparent diameters into two parts. Now ſince the ſpurious diameters of the ſtars thus included, as Mr Herſchel aſſures us, are continually changing according to the ſtate of the air, and the length of time we look at them, we are, in ſome reſpect, left at an uncertainty, and our meaſures taken at different times and with different degrees of attention, will vary on that account. Nor can we come at the true diſtance of the centres of any two ſtars, one from another, unleſs we could tell what to allow for the ſemidiameters of the ſtars themſelves; for different ſtars have different apparent diameters, which, with a power of 227, may differ from each other as far as two ſeconds.

The next imperfection is that which ariſes from a deflection of light upon the wires when they approach very near to each other; for if this be owing to a power of repulſion lodged at the ſurface, it is eaſy to underſtand, that ſuch powers muſt interfere with each other, and give the meaſures larger in proportion than they would have been if the repulſive power of one wire had not been oppoſed by a contrary power of the other wire.

Another very conſiderable imperfection of theſe micrometers is a continual uncertainty of the real zero. Mr Herſchel has found, that the leaſt alteration in the ſituation and quantity of light will affect the zero, and that a change in the poſition of the wires, when the light and other circumſtances remain unaltered, will alſo produce a difference. To obviate this difficulty whenever he took a meaſure that required the utmoſt accuracy, his zero was always taken immediately after, while the apparatus remained in the ſame ſituation it was in when the meaſure was taken; but this enhances the difficulty, becauſe it introduces an additional obſervation.

The next imperfection, which is none of the ſmalleſt, is that every micrometer that has hitherto been in uſe requires either a ſcrew, or a divided bar and pinion to meaſure the diſtance of the wires or divided image. Thoſe who are acquainted with works of this kind are but too ſenſible how difficult it is to have ſcrews that ſhall be perfectly equal in every thread or revolution of each thread; or pinions and bars that ſhall be ſo evenly divided as perfectly to be depended upon in every leaf and tooth to perhaps the two, three, or four thouſandth part of an inch: and yet, on account of the ſmall ſcale of thoſe micrometers, theſe quantities are of the greateſt conſequence; an error of a ſingle thouſandth part inducing in moſt inſtruments a miſtake of ſeveral ſeconds.

The laſt and greateſt imperfection of all is that theſe wire micrometers require a pretty ſtrong light in the field of view; and when Mr Herſchel had double ſtars to meaſure, one of which was very obſcure, he was obliged to be content with leſs light than is neceſſary to make the wires perfectly diſtinct; and ſeveral ſtars on this account could not be meaſured at all, though otherwiſe not too cloſe for the micrometer.

Mr Herſchel, therefore, having long had much occaſion for micrometers that would meaſure exceeding ſmall diſtances exactly, was led to bend his attention to the improvement of theſe inſtruments; and the reſult of his endeavours has been a very ingenious inſtrument called a *lamp-micrometer*, which is not only free from the imperfections above ſpecified, but alſo poſſeſſes the advantages of a very large ſcale. This inſtrument is deſcribed in the Philoſophical Tranſactions for 1782; and the conſtruction of it is as follows:

ABGCFE (fig. 14.) is a ſtand nine feet high, upon which a ſemicircular board *qhogp* is moveable upwards or downwards, in the manner of ſome fire-ſcreens as occaſion may require, and is held in its ſituation by a peg *p* put into any one of the holes of the upright piece A B. This board is a ſegment of a circle of fourteen inches radius, and is about three inches broader than a ſemicircle, to give room for the handles *r* D, *e* P, to work. The uſe of this board is to carry an arm L, thirty inches long, which is made to move upon a pivot at the centre of the circle, by means of a ſtring, which paſſes in a groove upon the edge of the ſemicircle *pgohq*; the ſtring is faſtened to a hook at *o* (not expreſſed in the figure, being at the back of the arm L), and paſſing along the groove from *oh* to *q* is turned over a pully at *q*, and goes down to a ſmall barrel *e*, within the plane of the circular board where a double-jointed handle *e* P commands its motion. By this contrivance, we ſee, the arm L may be lifted up to any altitude from the horizontal poſition to the perpendicular, or be ſuffered to deſcend by its own weight below the horizontal to the reverſe perpendicular ſituation. The weight of the handle P is ſufficient to the keep the arm in any given poſition; but if the motion ſhould be too eaſy, a friction ſpring applied to the barrel will moderate it at pleaſure.

In front of the arm L a ſmall ſlider, about three inches long, is moveable in a rabbet from the end L towards the centre backwards and forwards. A ſtring is faſtened to the left ſide of the little ſlider, and goes towards L, where it paſſes round a pully at *m*, and returns under the arm from *m*, *n*, towards the centre where it is led in a groove on the edge of the arm, which is of a circular form, upwards to a barrel (raiſed above the plane of the circular board) at *r*, to which the handle *r* D is faſtened. A ſecond ſtring is faſtened to the ſlider, at the right ſide, and goes towards the centre, where it paſſes over a pully *n*; and the weight *w*, which is ſuſpended by the end of this ſtring, returns the ſlider towards the centre, when a contrary turn of the handle permits it to act.

By *a* and *b* are repreſented two ſmall lamps, two inches high, 1 $\frac{1}{2}$ in breadth by 1 $\frac{1}{4}$ in depth. The ſides back, and top, are made ſo as to permit no light to be ſeen, and the front conſiſts of a thin braſs ſliding-door. The flame in the lamp *a* is placed three-tenths of an inch from the left ſide, three-tenths from the front, and half an inch from the bottom. In the lamp *b* it is placed at the ſame height and diſtance, meaſuring from the right ſide. The wick of the flame conſiſts only of a ſingle very thin lamp cotton thread; for the ſmalleſt flame being ſufficient, it is eaſier to keep it burning in ſo confined a place. In the top of each lamp muſt be a little ſlit lengthways, and alſo a ſmall opening in one ſide near the upper part, to permit air enough to circulate to feed the flame. To prevent every reflection of light, the ſide opening of the lamp *a* ſhould be to the right, and that of the lamp *b* to the left. In the ſliding door of each lamp is made a ſmall hole with the point of a very fine needle juſt oppoſite the place where the wicks are burning, ſo that when the ſliders are ſhut down, and every thing dark, nothing ſhall be ſeen but two fine lucid points of the ſize of two ſtars of the third or fourth magnitude. The lamp *a* is placed ſo that its lucid point may be in the centre of the circular board where it remains fixed. The lamp *b* is hung to the little ſlider which moves in the rabbet of the arm, ſo that its lucid point, in an horizontal poſition of the arm, may be on a level with the lucid point in the centre. The moveable lamp is ſuſpended upon a peice of braſs faſtened to the ſlider by a pin exactly behind the flame, upon which it moves as a pivot. The lamp is balanced at the bottom by a leaden weight, ſo as always to remain upright, when the arm is either lifted above or depreſſed below the horizontal poſition. The double-jointed handles *r*D, *e*P, conſiſt of light deal rods, ten feet long, and the loweſt of them may have diviſions, marked upon it near the end P, expreſſing exactly the diſtance from the central lucid point in feet, inches, and tenths.

From this conſtruction we ſee, that a perſon at a diſtance of ten feet may govern the two lucid points, ſo as to bring them into any required poſition ſouth or north preceding or following from 0 to 90° by uſing the handle P, and alſo to any diſtance from ſix-tenths of an inch to five or ſix and twenty inches by means of the handle D. If any reflection or appearance of light ſhould be left from the top or ſides of the lamps, a temporary ſcreen, conſiſting of a long piece of paſteboard, or a wire frame covered with black cloth, of the length of the whole arm, and of any required breadth, with a ſlit of half an inch broad in the middle may be affixed to the arm by four bent wires projecting an inch or two before the lamps, ſituated ſo that the moveable lucid point may paſs along the opening left for that purpoſe.

Fig. 15. repreſents part of the arm L, half the real ſize; S the ſlider; *m*, the pulley, over which the cord *xtyz* is returned towards the centre; *v* the other cord going to the pully *n* of fig. 14. R the braſs piece moveable upon the pin *c*, to keep the lamp upright. At R is a wire rivetted to the braſs piece, upon which is held the lamp by a nut and ſcrew. Fig. 16. 17. repreſent the lamps *a*, *b*, with the ſliding doors open, to ſhow the ſituation of the wicks. W is the leaden weight with a hole *d*, in it, through which the wire R of fig. 15. is to be paſſed when the lamp is to be faſtened to the ſlider S. Fig. 18. repreſents the lamp *a* with the ſliding door ſhut; *l* the lucid point; and *ik* the openings at the top, and *s* at the ſides, for the admiſſion of air.

" Every ingenious artiſt (ſays Mr Herſchel) will ſoon perceive, that the motions of this micrometer are capable of great improvement by the application of wheels and pinions, and other well known mechanical reſources; but as the principal object is only to be able to adjuſt the two lucid points to the required poſition and diſtance, and to keep them there for a few minutes, while the obſerver goes to meaſure their diſtance, it will not be neceſſary to ſay more upon the ſubject.

" I am now to ſhow the application of this inſtrument. It is well known to opticians and others who have been in the habit of uſing optical inſtruments, that we can with one eye look into a microſcope or teleſcope, and ſee an object much magnified, while the naked eye may ſee a ſcale upon which the magnified picture is thrown. In this manner I have generally determined the power of my teleſcopes; and any one who has acquired a facility of taking ſuch obſervations will very ſeldom miſtake ſo much as one in fifty in determining the power of an inſtrument, and that degree of exactneſs is fully ſufficient for the purpoſe.

"The Newtonian form is admirably adapted to the uſe of this micrometer; for the obſerver ſtands always erect, and looks in a horizontal direction, notwithſtanding the teleſcope ſhould be elevated to the zenith. Beſides, his face being turned away from the object to which his teleſcope is directed, this micrometer may be placed very conveniently without cauſing the leaſt obſtruction to the view: therefore, when I uſe this inſtrument, I put it at ten feet diſtance from the left eye, in a line perpendicular to the tube of the teleſcope, and raiſe the moveable board to ſuch a height that the lucid point of the central lamp may be upon a level with the eye. The handles, lifted up, are paſſed through two loops faſtened to the tube, juſt by the obſerver, ſo as to be ready for his uſe. I ſhould obſerve, that the end of the tube is cut away, ſo as to leave the left eye entirely free to ſee the whole micrometer.

"Having now directed the teleſcope to a double ſtar, I view it with the right eye, and at the ſame time with the left ſee it projected upon the micrometer: then, by the handle P, which commands the poſition of the arm, I raiſe or depreſs it ſo as to bring the two lucid points to a ſimilar ſituation with the two ſtars; and, by the handle D, I approach or remove the moveable lucid point to the ſame diſtance of the two ſtars, ſo that the two lucid points may be exactly covered by or coincide with the ſtars. A little practice in this buſineſs ſoon makes it eaſy, eſpecially to one who has already been uſed to look with both eyes open.

"What remains to be done is very ſimple. With a proper rule, divided into inches and fortieth parts, I take the diſtance of the lucid points, which may be done to the greateſt nicety, becauſe, as I obſerved before, the little holes are made with the point of a very fine needle. The meaſure thus obtained is the tangent of the magnified angle under which the ſtars are ſeen to a radius of ten feet; therefore, the angle being found and divided by the power of the teleſcope gives the real angular diſtance of the centres of a double ſtar.

"For inſtance, September 25, 1781, I meaſured α Hercules with this inſtrument. Having cauſed the two lucid points to coincide exactly with the ſtars centre upon centre, I found the radius or diſtance of the central lamp from the eye 10 feet 4.15 inches; the tangent or diſtance of the two lucid points 50.6 fortieth parts of an inch; this gives the magnified angle 35′, and dividing by the power 460, which I uſed, we obtain 4″ 34‴ for the diſtance of the centres of the two ſtars. The ſcale of the micrometer at this very convenient diſtance with the power of 460, (which my teleſcope bears ſo well upon the fixed ſtars that for near a twelvemonth paſt I have hardly uſed any other), is above a quarter of an inch to a ſecond; and by putting on my power of 932, which in very fine evenings is extremely diſtinct, I obtain a ſcale of more than half an inch to a ſecond, without increaſing the diſtance of the micrometer; whereas the moſt perfect of my former micrometers, with the ſame inſtrument, had a ſcale of leſs than the two thouſandth part of an inch to a ſecond.

"The meaſures of this micrometer are not confined to double ſtars only, but may be applied to any other objects that require the utmoſt accuracy, ſuch as the diameters of the planets or their ſatellites, the mountains of the moon, the diameters of the fixed ſtars, &c.

"For inſtance, October 22. 1781, I meaſured the apparent diameter of α Lyræ; and judging it of the greateſt importance to increaſe my ſcale as much as convenient, I placed the micrometer at the greateſt convenient diſtance, and (with ſome trouble, for want of longer handles, which might eaſily be added) took the diameter of this ſtar by removing the two lucid points to ſuch a diſtance as juſt to encloſe the apparent diameter. When I meaſured my radius, it was found to be twenty-two feet ſix inches. The diſtance of the two lucid points was *about* three inches, for I will not pretend to *extreme* nicety in this obſervation, on account of the very great power I uſed, which was 6450. From theſe meaſures we have the magnified angle 38′ 10″: this divided by the power gives 0″.355 for the apparent diameter of α Lyræ. The ſcale of the micrometer, on this occaſion, was no leſs than 8.443 inches to a ſecond, as will be found by multiplying the natural tangent of a ſecond with the power and radius in inches.

"November 28. 1781, I meaſured the diameter of the new ſtar; but the air was not very favourable, for this ſingular ſtar was not ſo diſtinct with 227 that evening as it generally is with 460: therefore, without laying much ſtreſs upon the exactneſs of the obſervation, I ſhall only report it to exemplify the uſe of the micrometer. My radius was 35 feet 11 inches. The diameter of the ſtar, by the diſtance of the lucid points was 2.4 inches, and the power I uſed 227: hence the magnified angle is found 19′, and the real diameter of the ſtar 5″.022. The ſcale of this meaſure .474 milleſimals of an inch, or almoſt half an inch to a ſecond."

In the Philoſophical Tranſactions for 1791, a very ſimple micrometer for meaſuring ſmall angles with the teleſcope, is deſcribed by Mr Cavallo; who introduces his deſcription with the following obſervations upon the different ſorts of teleſcopical micrometers in uſe. "Theſe inſtruments may be divided into two claſſes; namely, thoſe which have not, and thoſe which have, ſome movement amongſt their parts. The micrometers of the former ſort conſiſt moſtly of fine wires or hairs, variouſly diſpoſed, and ſituated within the teleſcope, juſt where the image of the object is formed. In order to determine an angle with thoſe micrometers, a good deal of calculation is generally required. The micrometers of the other ſort, of which there is a great variety, ſome being made with moveable parallel wires, others with priſms, others again with a combination of lenſes, and ſo on, are more or leſs ſubject to ſeveral inconveniencies, the principal of which are the following. 1. Their motions generally depend upon the action of a ſcrew; and of courſe the imperfections of its threads, and the greater or leſs quantity of loſt motion, which is obſervable in moving a ſcrew, eſpecially when ſmall, occaſion a conſiderable error in the menſuration of angles. 2. Their complication and bulk renders them difficultly applicable to a variety of teleſcopes, eſpecially to the pocket ones. 3. They do not meaſure the angle without ſome loſs of time, which is neceſſary to turn the ſcrew, or to move ſome other mechaniſm. 4. and laſtly, They are conſiderably expenſive, ſo that ſome of them coſt even more than a tolerably good teleſcope."

After having had long in view (our author informs us) the conſtruction of a micrometer which might be in part at leaſt, if not entirely, free from all thoſe objections; he, after various attempts, at laſt ſucceeded with a ſimple contrivance, which after repeated trials, has been found to anſwer the deſired end, not only from his own experience, but from that alſo of ſeveral friends, to whom it has been communicated.

This micrometer, in ſhort, conſiſts of a thin and narrow ſlip of mother-of-pearl finely divided, and ſituated in the focus of the eye-glaſs of a teleſcope, juſt where the image of the object is formed. It is immaterial whether the teleſcope be a refractor or a reflector, provided the eye-glaſs be a convex lens, and not a concave one as in the Galilean conſtruction.

The ſimpleſt way of fixing it is to ſtick it upon the diaphragm which generally ſtands within the tube and in the focus of the eye-glaſs. When thus fixed, if you look through the eye-glaſs, the diviſions of the micrometrical ſcale will appear very diſtinct, unleſs the diaphragm is not exactly in the focus; in which caſe, the micrometrical ſcale muſt be placed exactly in the focus of the eye-glaſs, either by puſhing the diaphragm backwards or forwards, when that is practicable; or elſe the ſcale may be eaſily removed from one or other ſurface of the diaphragm by the interpoſition of a circular piece of paper or card, or by a bit of wax. This conſtruction is fully ſufficient, when the teleſcope is always to be uſed by the ſame perſon; but when different perſons are to uſe it, then the diaphragm which ſupports the micrometer muſt be conſtructed ſo as to be eaſily moved backwards or forwards, though that motion needs not be greater than about a tenth or an eighth of an inch. This is neceſſary, becauſe the diſtance of the focus of the ſame lens appears different to the eyes of different perſons; and, therefore, whoever is going to uſe the teleſcope for the menſuration of any angle, muſt firſt of all unſcrew the tube which contains the eye-glaſs and micrometer from the reſt of the teleſcope, and, looking through the eye-glaſs, muſt place the micrometer where the diviſions of it may appear quite diſtinct to his eye.

In caſe that any perſon ſhould not like to ſee always the micrometer in the field of the teleſcope, then the micrometrical ſcale, inſtead of being fixed to the diaphragm, may be fitted to a circular perforated plate of braſs, wood, or even paper, which may be occaſionally placed upon the ſaid diaphragm.

Mr Cavallo has made ſeveral experiments to determine the moſt uſeful ſubſtance for this micrometer.—Glaſs, which he had ſucceſsfully applied for a ſimilar purpoſe to the compound microſcope, ſeemed at firſt to be the moſt promiſing; but it was at laſt rejected after ſeveral trials: for the diviſions upon it generally are either too fine to be perceived, or too rough; and though with proper care and attention the diviſions may be proportioned to the ſight, yet the thickneſs of the glaſs itſelf obſtructs in ſome meaſure the diſtinct view of the object. Ivory, horn, and wood, were found uſeleſs for the conſtruction of this micrometer, on account of their bending, ſwelling and contracting very eaſily; whereas mother-of-pearl is a very ſteady ſubſtance, the diviſions upon it may be marked very eaſily, and when it is made as thin as common writing paper it has a very uſeful degree of tranſparency.

Fig. 19. exhibits this micrometer ſcale, but ſhows it four times larger than the real ſize of one, which he has adapted to a three-feet achromatic teleſcope that magnifies about 84 times. It is ſomething leſs than the 24th part of an inch broad; its thickneſs is equal to that of common writing paper; and the length of it is determined by the aperture of the diaphragm, which limits the field of the teleſcope. The diviſions upon it are the 200ths of an inch, which reach from one edge of the ſcale to about the middle of it, excepting every fifth and tenth diviſion, which are longer. The divided edge of it paſſes through the centre of the field of view, though this is not a neceſſary precaution in the conſtruction of this micrometer. Two diviſions of the above deſcribed ſcale in my teleſcope are very nearly equal to one minute; and as a quarter of one of thoſe diviſions may be very well diſtinguiſhed by eſtimation, therefore an angle of one eighth part of a minute, or of 7″½, may be meaſured with it.

When a teleſcope magnifies more, the diviſions of the micrometer muſt be more minute; and Mr Cavallo finds, that when the focus of the eye-glaſs of the teleſcope is ſhorter than half an inch, the micrometer may be divided with the 500ths of an inch; by means of which, and the teleſcope magnifying about 200 times, one may eaſily and accurately meaſure an angle ſmaller than half a ſecond. On the other hand, when the teleſcope does not magnify above 30 times, the diviſions need not be ſo minute: for inſtance, in one of Dolland's pocket teleſcopes, which when drawn out for uſe is about 14 inches long, a micrometer with the hundreths of an inch is quite ſufficient, and one of its diviſions is equal to little leſs than three minutes, ſo that an angle of a minute may be meaſured by it.

"In looking through a teleſcope furniſhed with ſuch a micrometer (ſays our author), the field of view appears divided by the micrometer ſcale, the breadth of which occupies about one-ſeventh part of the aperture; and as the ſcale is ſemitranſparent, that part of the object which happens to be behind it may be diſcerned ſufficiently well to aſcertain the diviſion, and even the quarter of a diviſion, with which its borders coincide. Fig. 20. ſhews the appearance of the field of my teleſcope with the micrometer, when directed to the title page of the Philoſophical Tranſactions, wherein one may obſerve that the thickneſs of the letter C is equal to three-fourths of a diviſion, the diameter of the O is equal to three diviſions, and ſo on.

"At firſt view, one is apt to imagine, that it is difficult to count the diviſions which may happen to cover or to meaſure an object; but upon trial it will be found, that this is readily performed; and even people who have never been uſed to obſerve with the teleſcope, ſoon learn to meaſure very quickly and accurately with this micrometer; for ſince every fifth and tenth diviſion is longer than the reſt, one ſoon acquires the habit of ſaying, five, ten, fifteen; and then, by adding the other diviſions leſs than five, completes the reckoning. Even with a teleſcope which has no ſtand, if the object end of it be reſted againſt a ſteady place, and the other end be held by the hand near the eye of the obſerver, an object may be meaſured with accuracy ſufficient for ſeveral purpoſes, as for the eſtimation of ſmall diſtances, for determining the height of a houſe, &c.

"After having conſtructed and adapted this micrometer to the teleſcope, it is then neceſſary to aſcertain the value of the diviſions. It is hardly neceſſary to mention in this place, that though thoſe diviſions meaſure the chords of the angles, and not the angles or arches themſelves, and the chords are not as the arches, yet it has been ſhown by all the trigonometrical writers, that in ſmall angles the chords, arches, ſines, and tangents, follow the ſame proportion ſo very nearly, that the very minute difference may be ſafely neglected: ſo that if one diviſion of this micrometer is equal to one minute, we may ſafely conclude that two diviſions are equal to two minutes, three diviſions to three minutes, and ſo on. There are various methods of aſcertaining the value of the diviſions of ſuch a micrometer, they being the very ſame that are uſed for aſcertaining the value of the diviſions in other micrometers. Such are, the paſſage of an equatorial ſtar over a certain number of diviſions in a certain time; or the meaſuring of the diameter of the ſun by computation from the focal diſtance of the object and other lenſes of the teleſcope; the laſt of which however, is ſubject to ſeveral inaccuracies; but as they are well known to aſtronomical perſons, and have been deſcribed in many books, they need not be farther noticed here. However, for the ſake of workmen and other perſons not converſant in aſtronomy, I ſhall deſcribe an eaſy and accurate method of aſcertaining the value of the diviſions of the micrometer.

"Mark upon a wall or other place the length of ſix inches, which may be done by making two dots or lines ſix inches aſunder, or by fixing a ſix-inch ruler upon a ſtand; then place the teleſcope before it ſo that the ruler or ſix-inch length may be at right angles with the direction of the teleſcope, and juſt 57 feet $3\frac{1}{2}$ inches diſtant from the object glaſs of the teleſcope: this done, look through the teleſcope at the ruler or other extenſion of ſix inches, and obſerve how many diviſions of the micrometer are equal to it, and that ſame number of diviſions is equal to half a degree, or 30′; and this is all that needs be done for the required determination; the reaſon of which is becauſe an extenſion of ſix inches ſubtends an angle of 30′ at the diſtance of 57 feet $3\frac{1}{4}$ inches, as may be eaſily calculated by the rules of plane trigonometry.

"In one of Dollond's 14-inch pocket teleſcopes if the diviſions of the micrometer be the hundredths of an inch, $11\frac{1}{2}$ of thoſe diviſions will be found equal 30′, or 23 to a degree. When this value has been once aſcertained, any other angle meaſured by any other number of diviſions is determined by the rule of three. Thus, ſuppoſe that the diameter of the ſun ſeen through the ſame teleſcope, be found equal to 12 diviſions, ſay as $11\frac{1}{2}$ diviſions are to 30 minutes, ſo are 12 diviſions to $\left(\frac{12' \times 30'}{11.5}\right)$ 31′.3, which is the required diameter of the ſun.

"Notwithſtanding the facility of this calculation, a ſcale may be made anſwering to the diviſions of a micrometer, which will ſhow the angle correſponding to any number of diviſions to mere inſpection. Thus, for the above-mentioned ſmall teleſcope, the ſcale is repreſented in fig. 21. AB is a line drawn at pleaſure; it is then divided into 23 equal parts, and thoſe diviſions which repreſent the diviſions of the micrometer that are equal to one degree, are marked on one ſide of it. The line then is divided again into 60 equal parts, which are marked on the other ſide of it; and theſe diviſions repreſent the minutes which correſpond to the diviſions of the micrometer; thus the figure ſhows, that ſix diviſions of the micrometer are equal to $15\frac{1}{5}$ minutes, $11\frac{1}{4}$ diviſions are nearly equal to 29 minutes, &c. What has been ſaid of minutes may be ſaid of ſeconds alſo, when the ſcale is to be applied to a large teleſcope.

"Thus far this micrometer and its general uſe have been ſufficiently deſcribed; and mathematical perſons may eaſily apply it to the various purpoſes to which micrometers have been found ſubſervient. But as the ſimplicity, cheapneſs, and at the ſame time the accuracy of this contrivance, may render the uſe of it much more general than that of any other micrometer; and I may venture to ſay, that it will be found very uſeful in the army, and amongſt ſea-faring people, for the determination of diſtances, heights, &c.; I ſhall therefore join ſome practical rules to render this micrometer uſeful to perſons unacquainted with trigonometry and the uſe of logarithms.

"Problem I. The angle, not exceeding one degree which is ſubtended by an extenſion of one foot, being given, to find its diſtance from the place of obſervation. *N. B.* This extenſion of one foot or any other which may be mentioned hereafter, muſt be perpendicular to the direction of the teleſcope through which it is obſerved. The diſtances are reckoned from the object-glaſs of the teleſcope; and the anſwers obtained by the rules of this problem, though not exactly tree, are however ſo little different from the truth, that the difference ſeldom amounts to more than two or three inches, which may be ſafely neglected.

"Rule 1. If the angle be expreſſed in minutes, ſay as the given angle is to 60, ſo is 687.55 to a fourth proportional, which gives the anſwer in inches. —2. If the angle be expreſſed in ſeconds, ſay, as the given angle is to 3600, ſo is 687.55 to a fourth proportional, which expreſſes the anſwer in inches. —3. If the angle be expreſſed in minutes and ſeconds, turn it all into ſeconds, and proceed as above.

"Example. At what diſtance is a globe of one foot in diameter when it ſubtends an angle of two ſeconds?

$$2 : 3600 :: 687{,}55 : \frac{3600 \times 687.55}{2} = 1237590$$

inches, or $103132\frac{1}{2}$ feet which is the anſwer required.

This

Fig. 12

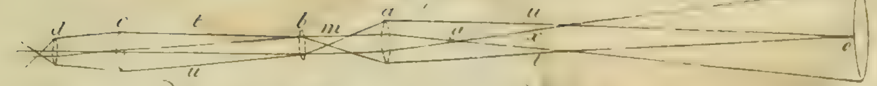


Fig. 16

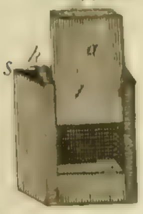


Fig. 14

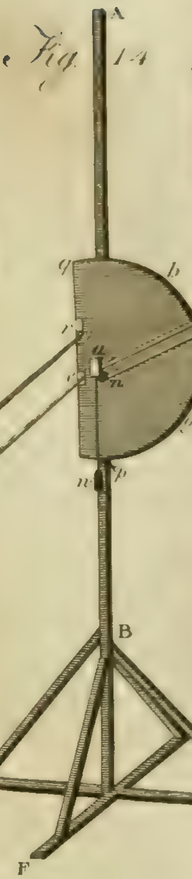


Fig. 13

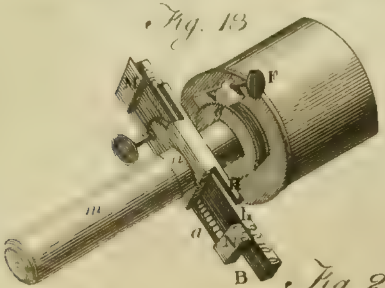


Fig. 23

Fig. 15

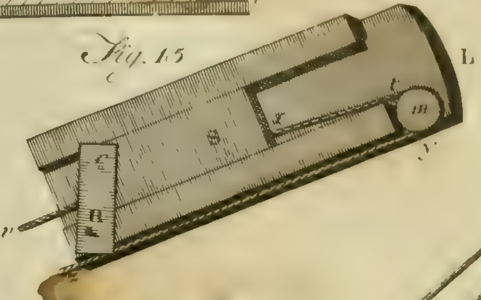


Fig 22

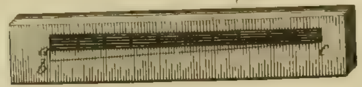


Fig. 17

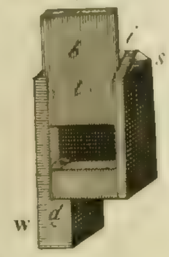


Fig. 25

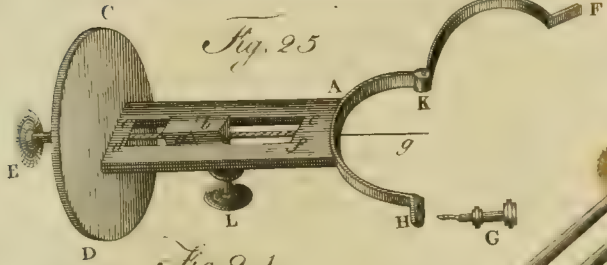


Fig. 18

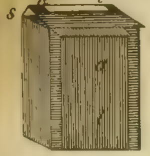


Fig. 24

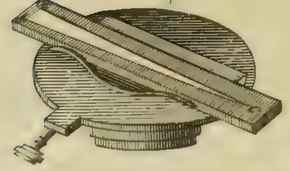


Fig. 20

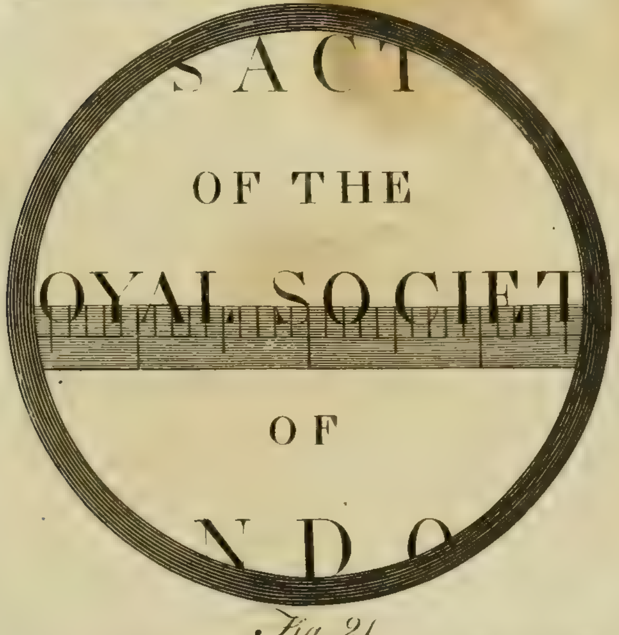


Fig. 19

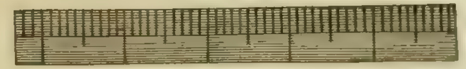


Fig. 26

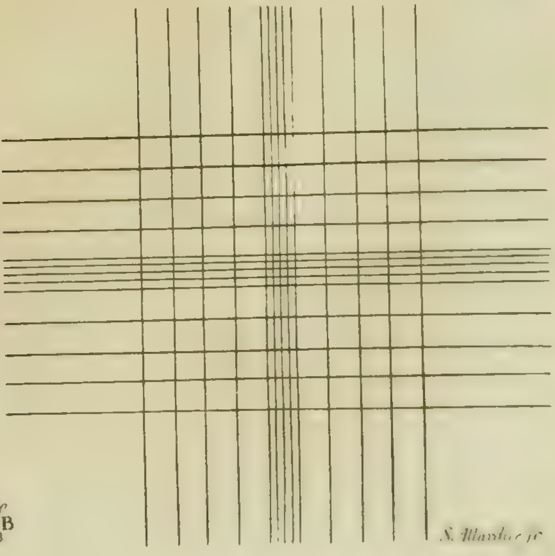
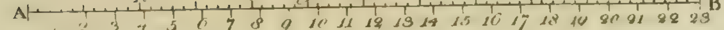


Fig. 21



S. Mardue fc

Micrometer.

" This calculation may be ſhortened; for ſince two of the three proportionals are fixed, their product in the firſt caſe is 41253, and in the other two caſes is 2475180; ſo that in the firſt caſe, viz. when the angle is expreſſed in minutes, you need only divide 41253 by the given angle; and in the other two caſes, viz. when the angle is expreſſed in ſeconds, divide 2475180 by the given angle, and the quotient in either caſe is the anſwer in inches.

" Problem II. The angle, not exceeding one degree, which is ſubtended by any known extenſion, being given, to find its diſtance from the place of obſervation.

" Rule. Proceed as if the extenſion were of one foot by Problem I. and call the anſwer B; then, if the extenſion in queſtion be expreſſed in inches, ſay, as 12 inches are to that extenſion, ſo is B to a fourth proportional, which is the anſwer in inches; but if the extenſion in queſtion be expreſſed in feet, then you need only multiply it by B, and the product is the anſwer in inches,

" Example, At what diſtance is a man ſix feet high when he appears to ſubtend an angle of 30″.

" By problem I. if the man were one foot high, the diſtance would be 82506 inches; but as he is ſix feet high, therefore multiply 82506 by 6, and the product gives the required diſtance, which is 495036 inches, or 41253 feet.

Micrometer.

" For greater conveniency, eſpecially in travelling, or in ſuch circumſtances in which one has not the opportunity of making even the eaſy calculation required in thoſe problems, I have calculated the following two tables; the firſt of which ſhows the diſtance anſwering to any angle from one minute to one degree, which is ſubtended by an extention of one foot; and the ſecond table ſhows the diſtance anſwering to any angle from one minute to one degree, which is ſubtended by a man, the height of which has been called an extenſion of ſix feet; becauſe at a mean, ſuch is the height of a man when dreſſed with hat and ſhoes on. Theſe tables may be tranſcribed on a card, and may be had always ready with a pocket teleſcope furniſhed with a mircometer. Their uſe is evidently to aſcertain diſtances without any calculation; and they are calculated only to minutes, becauſe with a pocket teleſcope and micrometer it is not poſſible to meaſure an angle more accurately than to a minute.

" Thus, if one wants to meaſure the extenſion of a ſtreet, let a foot ruler be placed at the end of the ſtreet; meaſure the angular appearance of it, which ſuppoſe to be 36′, and in the table you will have the required diſtance againſt 36′, which is 95½ feet. Thus alſo a man who appears to be 49′ high, is at the diſtance of 421 feet.

Angles ſubtended by an extenſion of one foot at different diſtances.

Angles.	Diſtances in feet.	Angles.	Diſtances in feet.
Min. 1	3437,7	Min. 31	110,9
2	1718,9	32	107,4
3	1145,9	33	104,2
4	859,4	34	101,1
5	687,5	35	98,2
6	572,9	36	95.5
7	491,1	37	92,9
8	429,7	38	90,4
9	382,0	39	88,1
10	343,7	40	85,9
11	312,5	41	83,8
12	286,5	42	81,8
13	264,4	43	79,9
14	245,5	44	78,1
15	229,2	45	76,4
16	214,8	46	74,7
17	202,2	47	73,1
18	191,0	48	71,6
19	180,9	49	70,1
20	171,8	50	68,7
21	162,7	51	67,4
22	156,2	52	66,1
23	149,4	53	64,8
24	143,2	54	63,6
25	137,5	55	62,5
26	132,2	56	61,4
27	127,3	57	60,3
28	122,7	58	59,2
29	118,5	59	58,2
30	114,6	60	57,3

Angles ſubtended by an extenſion of ſix feet at different diſtances.

Angles.	Diſtances in feet.	Angles.	Diſtances in feet.
Min. 1	20626,8	Min. 31	665,4
2	10313.	32	644,5
3	6875,4	33	625.
4	5156,5	34	606,6
5	4125,2	35	589,3
6	3437,7	36	572,9
7	2946,6	37	557,5
8	2578,2	38	542,8
9	2291,8	39	528,9
10	2062,6	40	515,6
11	1875,2	41	503,1
12	1718,8	42	491,1
13	1586,7	43	479,7
14	1473,3	44	468,8
15	1375.	45	458,4
16	1298,1	46	448,4
17	1213,3	47	438,9
18	1145,9	48	429,7
19	1085,6	49	421.
20	1031,4	50	412,5
21	982,2	51	404,4
22	937,6	52	396,7
23	806,8	53	389,2
24	859,4	54	381,9
25	825.	55	375.
26	793,3	56	368,3
27	763,9	57	561,9
28	739,6	58	355,6
29	711,3	59	349,6
30	687,5	60	343,7

II. The micrometer has not only been applied to teleſcopes, and employed for aſtronomical purpoſes; but there have alſo been various contrivances for adapting it to MICROSCOPICAL obſervations. Mr Leeuwenhoek's method of eſtimating the ſize of ſmall objects was by comparing them with grains of ſand, of which 100 in a line took up an inch. Theſe grains he laid upon the ſame plate with his objects, and viewed them at the ſame time. Dr Jurin's method was ſimilar to this; for he found the diameter of a piece of fine ſilver wire, by wrapping it as cloſe as he could about a pin, and obſerving how many rings made an inch; and he uſed this wire in the ſame manner as Leeuwenhoek uſed his ſand. Dr Hooke uſed to look upon the magnified object with one eye, while at the ſame time he viewed other objects placed at the ſame diſtance with the other eye. In this manner he was able, by the help of a ruler, divided into inches and ſmall parts, and laid on the pedeſtal of the microſcope, to caſt as it were the magnified appearance of the object upon the ruler, and thus exactly to meaſure the diameter which it appeared to have through the glaſs; which being compared with the diameter as it appeared to the naked eye, eaſily ſhowed the degree in which it was magnified. A little practice ſays, Mr Baker will render this method exceedingly eaſy and pleaſant.

Mr Martin in his Optics recommended ſuch a micrometer for a microſcope as had been applied to teleſcopes: for he adviſes to draw a number of parallel lines on a piece of glaſs, with the fine point of a diamond at the diſtance of one-fortieth of an inch from one another, and to place it in the focus of the eye-glaſs. By this method, Dr Smith contrived to take the exact draught of objects viewed by a double microſcope for he adviſes to get a lattice, made with ſmall ſilver wires or ſquares, drawn upon a plain glaſs by the ſtrokes of a diamond, and to put it into the place of the image, formed by the object-glaſs: then by transferring the parts of the object, ſeen in the ſquares of the glaſs or lattice upon ſimilar correſponding ſquare drawn on paper, the picture may be exactly taken. Mr Martin alſo introduced into compound microſcopes another micrometer conſiſting of a ſcrew. See both theſe methods deſcribed in his *Optics*, p. 277.

The mode of actual admeaſurement (Mr Adams obſerves *) is without doubt the moſt ſimple that can be uſed; as by it we comprehend in a manner, at one glance, the different effects of combined glaſſes; and as it ſaves the trouble, and avoids the obſcurity, of the uſual modes of calculation: but many perſons find it exceedingly difficult to adopt this method, becauſe they have not been accuſtomed to obſerve with both eyes at once. To obviate this inconvenience, the late Mr Adams contrived an inſtrument called the *Needle-Micrometer*, which was firſt deſcribed in his *Micrographia Illuſtrata;* and of which as now conſtructed, we have the following deſcription by his ſon Mr George Adams in the ingenious Eſſays above quoted.

This micrometer conſiſts of a ſcrew, which has 50 threads to an inch; this ſcrew carries an index, which points to the diviſions on a circular plate, which is fixed at right angles to the axis of the ſcrew. The revolutions of the ſcrew are counted on a ſcale which is an inch divided into 50 parts; the index to theſe diviſions is a flower-de-luce marked upon the ſlider, which carries the needle point acroſs the field of the microſcope. Every revolution of the micrometer ſcrew meaſures $\frac{1}{50}$ part of an inch, which is again ſubdivided by means of the diviſions on the circular plate, as this is divided into 20 equal parts, over which the index paſſes at every revolution of the ſcrew; by which means we obtain with eaſe the meaſure of 1000th part of an inch: for 50, the number of threads on the ſcrew in one inch, being multiplied by 20, the diviſions on the circular plate are equal to 1000; ſo that each diviſion on the circular plate ſhows that the needle has either advanced or receded 1000th part of an inch.

Plate CCXCVI.

To place this micrometer on the body of the microſcope, open the circular part FKH, fig. 25. by taking out the ſcrew G, throw back the ſemicircle FK, which moves upon a joint at K; then turn the ſliding tube of the body of the microſcope, ſo that the ſmall holes which are in both tubes may exactly coincide, and let the needle *g* of the micrometer have a free paſſage through them; after this, ſcrew it faſt upon the body by the ſcrew G. The needle will now traverſe the field of the microſcope, and meaſure the length and breadth of the image of any object that is applied to it. But further aſſiſtance muſt be had, in order to meaſure the object itſelf, which is a ſubject of real importance; for though we have aſcertained the power of the microſcope, and know that it is ſo many thouſand times, yet this will be of little aſſiſtance towards aſcertaining an accurate idea of its real ſize; for our ideas of bulk being formed by the compariſon of one object with another, we can only judge of that of any particular body, by comparing it with another whoſe ſize is known: the ſame thing is neceſſary, in order to form an eſtimate by the microſcope; therefore to aſcertain the real meaſure of the object, we muſt make the point of the needle paſs over the image of a known part of an inch placed on the ſtage, and write down the revolutions made by the ſcrew, while the needle paſſed over the image of this known meaſure; by which means we aſcertain the number of revolutions on the ſcrew, which are adequate to a real and known meaſure on the ſtage. As it requires an attentive eye to watch the motion of the needle point as it paſſes over the image of a known part of an inch on the ſtage, we ought not to truſt to one ſingle meaſurement of the image, but ought to repeat it at leaſt ſix times; then add the ſix meaſures thus obtained together, and divide their ſum by ſix, or the number of trials; the quotient will be the mean of all the trials. This reſult is to be placed in a column of a table next to that which contains the number of the magnifiers.

By the aſſiſtance of the ſectoral ſcale, we obtain with eaſe a ſmall part of an inch. This ſcale is ſhown at fig. 22, 23, 24, in which the two lines *ca*, *cb*, with the ſide *ab*, form an iſoſceles triangle; each of the ſides is two inches long, and the baſe ſtill only of one-tenth of an inch. The longer ſides may be of any given length, and the baſe ſtill only of one tenth of an inch. The longer lines may be conſidered as the line of lines upon a ſector opened to one-tenth of an inch. Hence whatever number of equal parts *ca*, *cb* are divided into, their tranſverſe meaſure will be ſuch a part of one-tenth as is expreſſed by their diviſions. Thus if it be divided into ten equal parts, this will divide the inch into 100 equal parts; the firſt diviſion next *c* will be equal to 100th part of an inch, becauſe it is the tenth part of one tenth of an inch. If theſe lines are divided into twenty equal parts, the inch will be by that means divided into 200 equal parts. Laſtly, if *ab*, *ca*, are made three inches long and divided into 100 equal parts, we obtain with eaſe the 1000th part. The ſcale is repreſented as ſolid at fig. 23. but as perforated at fig. 22. and 24. ſo that the light paſſes thro' the aperture, when the ſectoral part is placed on the ſtage.

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* Microſcopical Eſſays p. 59.

To uſe this ſcale, firſt fix the micrometer, fig. 25. to the body of the microſcope; then fit the ſectoral ſcale, fig. 24. in the ſtage, and adjuſt the microſcope to its proper focus or diſtance from the ſcale, which is to be moved till the baſe appears in the middle of the field of view; then bring the needle point *g*, fig. 25. (by turning the ſcrew L) to touch one of the lines *ca*, exactly at the point anſwering to 20 on the ſectoral ſcale. The index *a* of the micrometer is to be ſet to the firſt diviſion, and that on the dial plate to 20, which is both the beginning and end of its diviſions; we are then prepared to find the magnifying power of every magnifier in the compound microſcope which we are uſing.

Example. Every thing being prepared agreeable to the foregoing directions, ſuppoſe you are deſirous of aſcertaining the magnifying power of the lens marked N° 4. turn the micrometer ſcrew until the point of the needle point traverſed the magnified image of the tenth part of one inch; then the diviſion where the two indices remain, will ſhow how many revolutions, and parts of a revolution, the ſcrew has made, while the needle point traverſed the magnified image of the one tenth of an inch; ſuppoſe the reſult to be 26 revolutions of the ſcrew, and 14 parts of another revolution, this is equal to 26 multiplied by 20, added to 14; that is, 534,000 parts of an inch.—The 26 diviſions found on the ſtraight ſcale of the micrometer, while the point of the needle paſſed over the magnified image of one-tenth part of an inch, were multiplied by 20, becauſe the circular plate CD, fig. 25. is divided into 20 equal parts; this produced 520; then adding the 14 parts of the next revolution, we obtain the 534,000 parts of an inch, or five-tenths and 3400 parts of another tenth, which is the meaſure of the magnified image of one-tenth of an inch at the aperture of the eye-glaſſes or at their foci. Now if we ſuppoſe the focus of the two eye-glaſſes to be one inch, the double thereof is two inches; or if we reckon in the 1000th part of an inch, we have 2000 parts for the diſtance of the eye from the needle point of the micrometer. Again, if we take the diſtance of the image from the object at the ſtage at 6 inches, or 6000, and add thereto 2000, double the diſtance of the focus of the eye glaſs, we ſhall have 8000 parts of an inch for the diſtance of the eye from the objects; and as the glaſſes double the image, we muſt double the number 534 found upon the micrometer, which then makes 1068: then, by the following analogy, we ſhall obtain the number of times the microſcope magnifies the diameter of the object; ſay, as 240, the diſtance of the eye from the image of the object, is to 800, the diſtance of the eye from the object; ſo is 1068, double the meaſure found on the micrometer, to 3563, or the number of times the microſcope magnifies the diameter of the object. By working in this manner, the magnifying power of each lens uſed with the compound microſcope may be eaſily found, though the reſult will be different in different compound microſcopes, varying according to the combination of the lenſes, their diſtance from the object and one another, &c.

Having diſcovered the magnifying power of the microſcope, with the different object lenſes that are uſed therewith, our next ſubject is to find out the real ſize of the objects themſelves, and their different parts: this is eaſily effected, by finding how many revolutions of the micrometer-ſcrew anſwer to a known meaſure on the ſectoral ſcale or other object placed on the ſtage; from the number thus found a table ſhould be conſtructed, expreſſing the value of the different revolutions of the micrometer with that object-lens, by which the primary number was obtained. Similar tables muſt be conſtructed for each object lens. By a ſet of tables of this kind, the obſerver may readily find the meaſure of any object he is examining; for he has only to make the needle point traverſe over this object, and obſerve the number of revolutions the ſcrew has made in its paſſage, and then look into his table for the real meaſure which correſponds to this number of revolutions, which is the meaſure required.

Mr Coventry of Southwark has favoured us with the deſcription of a micrometer of his own invention; the ſcale of which, for minuteneſs, ſurpaſſes every inſtrument of the kind of which we have any knowledge, and of which, indeed, we could ſcarcely have formed a conception, had he not indulged us with ſeveral of theſe inſtruments, graduated as underneath.

The micrometer is compoſed of glaſs, ivory, ſilver, &c. on which are drawn parallel lines from the 10th to the 10,000th part of an inch. But an inſtrument thus divided, he obſerves, is more for curioſity than uſe: but one of thoſe which Mr Coventry has ſent us is divided into ſquares, ſo ſmall that ſixteen millions of them are contained on the ſurface of one ſquare inch, each ſquare appearing under the microſcope true and diſtinct; and though ſo ſmall, it is a fact, that animalcula are found which may be contained in one of theſe ſquares.

The uſe of micrometers when applied to microſcopes, is to meaſure the natural ſize of the object and how much that object is magnified. To aſcertain the real ſize of an object in the ſingle microſcope, nothing more is required than to lay it on the micrometer, and adjuſt it to the focus of the magnifier, noticing how many diviſions of the micrometer it covers. Suppoſe the parallel lines of the micrometer to be the 1000th of an inch, and the object covers two diviſions; its real ſize is 500ths of an inch; if five, 200ths, and ſo on.

But to find how much the object is magnified, is not mathematically determined ſo eaſily by the ſingle as by the compound microſcope: but the following ſimple method (ſays Mr Coventry) I have generally adopted, and think it tolerably accurate. Adjuſt a micrometer under the microſcope *o*, ſay the 100th of an inch of diviſions, with a ſmall object on it; if ſquare, the better: notice how many diviſions one ſide of the object covers, ſuppoſe 10: then cut a piece of white paper ſomething larger than the magnified appearance of the object: then fix one eye on the object through the microſcope, and the other at the ſame time on the paper, lowering it down till the object and the paper appear level and diſtinct; then cut the paper till it appear exactly the ſize of the magnified object; the paper being then meaſured, ſuppoſe an inch ſquare: Now, as the object under the magnifier, which appeared to be one inch ſquare, was in reality only ten hundredths, or the tenth of an inch, the experiment proves that it is magnified ten times in length, one hundred times in ſuperfices, and one thouſand times in cube, which is the magnifying power of the glaſs; and in the ſame manner, a table may be made of the power of all the other glaſſes.

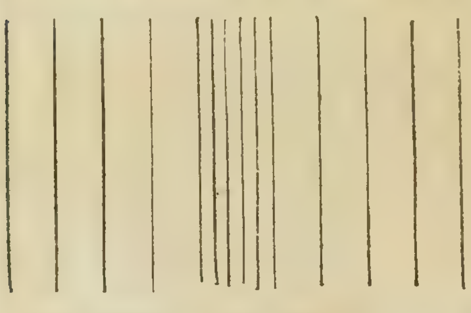
In uſing the compound microſcope, the real ſize of the object is found by the ſame method as in the ſingle: but to demonſtrate the magnifying power of each glaſs to greater certainty, adopt the following method.—Lay a two-feet rule on the ſtage, and a micrometer level with its ſurface (an inch ſuppoſed divided into 100 parts): with one eye ſee how many of thoſe parts are contained in the field of the microſcope, (ſuppoſe 50); and with the other, at the ſame time look for the circle of light in the field of the microſcope, which with a little practice will ſoon appear diſtinct; mark how much of the rule is interſected by the circle of light, which will be half the diameter of the field. Suppoſe eight inches; conſequently the whole diameter will be ſixteen. Now, as the real ſize of the field, by the micrometers, appeared to be only 50 hundredths or half an inch, and as half an inch is only one 32d part of 16 inches, it ſhows the magnifying power of the glaſs to be 32 times in length, 1024 ſuperfices, and 32,768 cube (E).

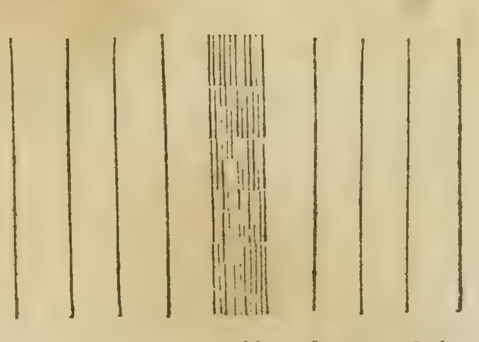
Another way of finding the magnifying power of compound microſcopes, is by uſing two micrometers of the ſame diviſions; one adjuſted under the magnifier, the other fixed in the body of the microſcope in the focus of the eye glaſs. Notice how many diviſions of the micrometer in the body are ſeen in one diviſion of the micrometer under the magnifier which again muſt be multiplied by the power of the eye-glaſs. Example: Ten diviſions of the micrometer in the body are contained in one diviſion under the magnifier; ſo far the power is increaſed ten times: now, if the eye-glaſs be one inch focus, ſuch glaſs will of itſelf magnify about eight times in length, which, with the ten times magnified before, will be eight times ten, or 80 times in length, 6400 ſuperficies and 512,000 cube.

"If (ſays Mr Coventry) theſe micrometers are employed in the ſolar microſcope, they divide the object into ſquares on the ſcreen in ſuch a manner as to render it extremely eaſy to make a drawing of it. And (ſays he) I apprehend they may be employed to great advantage with ſuch a microſcope as Mr Adam's Lucernal; becauſe this inſtrument may be uſed either by day or night, or in any place, and gives the actual magnifying power without calculation."

The caſe with which we have been favoured by Mr Coventry contains ſix micrometers, two on ivory and four on glaſs. One of thoſe on ivory is an inch divided into one hundred parts, every fifth line longer than the intermediate one, and every tenth longer ſtill, for the greater eaſe in counting the diviſions under the microſcope, and is generally uſed in meaſuring the magnifying power of microſcopes. The other ivory one is divided into ſquares of the 50th and 100th of of an inch, and is commonly employed in meaſuring opaque objects.

Thoſe made of the glaſs are for tranſparent objects, which, when laid on them, ſhow their natural ſize.—That marked on the braſs 100, are ſquares divided to the 100th of an inch: that marked 5000 are parallel lines forming nine diviſions, each diviſion the 1000th of an inch; the middle diviſion is again divided into 5, making diviſions to the 5000th of an inch. That marked 10,000 is divided in the ſame manner, with the middle diviſion divided into 10, making the 10,000th of an inch. Example:





The glaſs micrometer without any mark is alſo divided, the outſide lines into 100th, the next into 1000th, and the inſide lines into the 4000th of an inch: theſe are again croſſed with an equal number of lines in the ſame manner, making ſquares of the 100th, 1000th, and 4000th of an inch, thus demonſtrating each other's ſize. The middle ſquare of the 1000th of an inch (ſee fig. 26.) is divided into ſixteen ſquares; now

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(E) It will be neceſſary, for great accuracy, as well as for comparative obſervations, that the two feet rule ſhould always be placed at a certain diſtance from the eye: eight inches would, in general, be a proper diſtance.

now as 1000 ſquares in the length of an inch, multiplied by 1000, gives one million in an inch ſurface; by the ſame rule, one of thoſe ſquares divided into 16 muſt be the ſixteen millionth part of an inch ſurface. See fig. 26. which is a diminiſhed view of the apparent ſurface exhibited under the magnifier n° 1 of Wilſon's microſcope. In viewing the ſmalleſt lines, Mr Coventry uſes n° 2 or 3.; and they are all better ſeen, he ſays, by candle than by day-light.

MICROPUS, BASTARD CUDWEED: A genus of the polygamia neceſſaria order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ*. The receptacle is paleaceous; there is no pappus; the calyx is calyculated; there is no radius of the corolla. The female florets are wrapped in the ſcales of the calyx. There are two ſpecies, the ſupinus and erectus; but only the former is ever cultivated in gardens. It is an annual plant, growing naturally in Portugal, in places near the ſea. The root ſends out ſeveral trailing ſtalks about ſix or eight inches long, which are garniſhed with ſmall oval, ſilvery leaves, whoſe baſes embrace the ſtalks. The flowers come out in cluſters from the wings of the ſtalks, and are very ſmall, and of a white colour. It flowers in June and July; and is frequently preſerved in gardens on account of the beauty of its ſilvery leaves. It is eaſily propagated by ſeed ſown in autumn, and requires no other culture but to be kept free from weeds.

MICROSCOPE, an optical inſtrument, conſiſting of lenſes, or mirrors, by means of which ſmall objects appear larger than they do to the naked eye. *Single* microſcopes conſiſt of a ſingle lens or mirror; or if more lenſes or mirrors be made uſe of, they only ſerve to throw light upon the object, but do not contribute to enlarge the image of it. *Double* or *Compound* microſcopes are thoſe in which the image of an object is compoſed by means of more lenſes or mirrors than one.

For the principles on which the conſtruction of microſcopes depends, ſee OPTICS. In the preſent article, it is intended to deſcribe the finiſhed inſtrument with all its varied apparatus, according to the lateſt improvements; and to illuſtrate by proper details its uſes and importance.

I. *Of* SINGLE *Microſcopes.*

THE famous microſcopes made uſe of by Mr Leewenhoeck, were all, as Mr Baker aſſures us, of the ſingle kind, and the conſtruction of them was the moſt ſimple poſſible; each conſiſting only of a ſingle lens ſet between two plates of ſilver, perforated with a ſmall hole, with a moveable pin before it to place the object on and adjuſt it to the eye of the beholder. He informs us alſo, that lenſes only, and not *globules*, were uſed in every one of thoſe microſcopes.

Plate CCXCVII fig. 1.

1. The ſingle microſcope now moſt generally known and uſed is that called *Wilſon's Pocket Microſcope.* The body is made of braſs, ivory, or ſilver, and is repreſented by AA, BB. CC is a long fine-threaded male ſcrew that turns into the body of the microſcope; D a convex glaſs at the end of the ſcrew. Two concave round peices of thin braſs, with holes of different diameters in the middle of them, are placed to cover the abovementioned glaſs, and thereby diminiſh the aperture when the greateſt magnifiers are employed. EE, three thin plates of braſs within the body of the microſcope; one of which is bent ſemicircularly in the middle, ſo as to form an arched cavity for the reception of a tube of glaſs, the uſe of the other two being to receive and hold the ſliders between them. F, a piece of wood or ivory, arched in the manner of the ſemicircular plate, and cemented to it. G, the other end of the body of the microſcope, where a hollow female ſcrew is adapted to receive the different magnifiers. H, is a ſpiral ſpring of ſteel, between the end G and the plates of braſs, intended to keep the plates in a right poſition and counteract the long ſcrew CC. I, is a ſmall turned handle, for the better holding of the inſtrument, to ſcrew on or off at pleaſure.

To this microſcope belong ſix or ſeven magnifying glaſſes: ſix of them are ſet in ſilver, braſs, or ivory, as in the figure K; and marked 1, 2, 3, 4, 5, 6, the loweſt numbers being the greateſt magnifiers. L is the ſeventh magnifier, ſet in the manner of a little barrel, to be held in the hand for the viewing of any larger object. M, is a flat ſlip of ivory, called a *ſlider*, with four round holes through it, wherein to place objects between two peices of glaſs or Muſcovy talc, as they appear at *d d d d*. Six ſuch ſliders, and one of braſs, are uſually ſold with this microſcope ſome with objects placed in them, and others empty for viewing any thing that may offer: but whoever pleaſes to make a collection, may have as many as he deſires. The braſs ſlider is to confine any ſmall object, that it may be viewed without cruſhing or deſtroying it. N, is a tube of glaſs contrived to confine living objects, ſuch as frogs, fiſhes, &c. in order to diſcover the circulation of the blood. All theſe are contained in a little neat box of fiſh-ſkin or mahogany, very convenient for carrying in the pocket.

When an object is to be viewed, thruſt the ivory ſlider, in which the ſaid object is placed, between the two flat braſs plates EE: obſerving always to put that ſide of the ſlider where the braſs rings are fartheſt from the eye. Then ſcrew on the magnifying glaſs you intend to uſe, at the end of the inſtrument G; and looking through it againſt the light, turn the long ſcrew CC, till your object be brought to ſuit your eye; which will be known by its appearing perfectly diſtinct and clear. It is moſt proper to look at it firſt through a magnifier that can ſhow the whole at once and afterwards to inſpect the ſeveral parts more particularly with one of the greateſt magnifiers; for thus you will gain a true idea of the whole, and of all its parts. And though the greateſt magnifiers can ſhow but a minute portion of any object at once ſuch as the claw of a flea, the horn of a louſe, or the like; yet by gently moving the ſlider which contains the object the eye will gradually examine it all over.

As objects muſt be brought very near the glaſſes when the greateſt magnifiers are made uſe of, be careful not to ſcratch them by rubbing the ſlider againſt them as you move it in or out. A few turns of the ſcrew CC will eaſily prevent this miſchief, by giving them room enough. You may change the objects in your ſliders for any others you think proper, by taking out the braſs rings with the point of a penknife; the talcs will then fall out, if you but turn the ſliders;

and after putting what you pleaſe between them, by replacing the braſs rings you will faſten them as they were before. It is proper to have ſome ſliders furniſhed with tales, but without any object between them, to be always in readineſs for the examination of fluids ſalts, ſands, powders, the farina of flowers, or any other caſual objects of ſuch ſort as need only be applied to the outſide of the tale.

The circulation of the blood may be eaſieſt ſeen in the tails or fins of fiſhes, in the fine membranes between a frog's toes, or beſt of all in the tail of a water-newt. If your object be a ſmall fiſh, place it within the tube N, and ſpread its tail or fin along the ſide thereof: if a frog, chooſe ſuch an one as can but juſt be got into your tube; and, with a pen, or ſmall ſtick, expand the tranſparent membrane between the toes of the frog's hind foot as much as you can. When your object is ſo adjuſted that no part of it can intercept the light from the place, you intend to view, unſcrew the long ſcrew CC, and thruſt your tube into the arched cavity, quite through the body of the microſcope; then ſcrew it to the true focal diſtance, and you will ſee the blood paſſing along its veſſels with a rapid motion, and in a moſt ſurpriſing manner.

The third or fourth magnifiers may be uſed for frogs or fiſhes: but for the tails of water-newts, the fifth or ſixth will do; becauſe the globules of their blood are twice as large as thoſe of frogs or fiſh. The firſt or ſecond magnifier cannot well be employed for this purpoſe; becauſe the thickneſs of the tube in which the object lies, will ſcarce admit its being brought ſo near as the focal diſtance of the magnifier.

An apparatus for the purpoſe of viewing opaque objects generally accompanies this microſcope; and which conſiſts of the following parts. A braſs arm QR, which is ſcrewed at Q, upon the body of the microſcope at G. Into the round hole R, any of the magnifiers ſuitable to the object to be viewed are to be ſcrewed; and under it, in the ſame ring, the concave poliſhed ſilver ſpeculum S. Through a ſmall aperture in the body of the microſcope under the braſs plates EE, is to ſlide the long wire with the forceps T: This wire is pointed at one of its ends; and ſo, that either the points or forceps may be uſed for the objects as may be neceſſary. It is eaſy to conceive, therefore, that the arm at R, which turns by a twofold joint at *a* and *b*, may be brought with its magnifier over the object, the light reflected upon it by the application of the ſpeculum, and the true focus obtained by turning of the male ſcrew CC as before directed.—As objects are ſometimes not well fixed for view, either by the forceps or point, the ſmall peice ſhown at N is added, and in ſuch caſes anſwers better; it ſcrews over the point of T; it contains a ſmall round piece of ivory, blackened on one ſide, and left white upon the other as a contraſt to coloured objects, and by a ſmall piece of watch-ſpring faſtens down the objects upon the ivory.

2. *Single microſcope by reflection.* In fig. 2. A is a ſcroll of braſs fixed upright upon a round wooden baſe B, or mahogany drawer or caſe, ſo as to ſtand perfectly firm and ſteady. C is a braſs ſcrew, that paſſes through a hole in the upper limb of the ſcroll into the ſide of the microſcope D, and ſcrews it faſt to the ſaid ſcroll. E is a concave ſpeculum ſet in a box of braſs, which hangs in the arch G by two ſmall ſcrews *ff*, that ſcrew into the oppoſite ſides thereof. At the bottom of this arch is a pin of the ſame metal, exactly fitted to a hole *h* in the wooden pedeſtal made for the reception of the pin. As the arch turns on this pin, and the ſpeculum turns on the end of the arch, it may, by this twofold motion, be eaſily adjuſted in ſuch a manner as to reflect the light of the ſun of the ſky, or of a candle, directly upwards through the microſcope that is fixed perpendicularly over it; and by ſo doing may be made to anſwer many purpoſes of the large double reflecting microſcope. The body of the microſcope may alſo be fixed horizontally, and objects viewed in that poſition by any light you chooſe; which is an advantage the common double reflecting microſcope has not. It may alſo be rendered further uſeful by means of a ſlip of glaſs; one end of which being thruſt through between the plates where the ſliders go, and the other extending to ſome diſtance, ſuch objects may be placed thereon as cannot be applied in the ſliders: and then having a limb of braſs that may faſten to the body of the microſcope, and extend over the projecting glaſs a hollow ring wherein to ſcrew the magnifiers, all ſorts of ſubjects may be examined with great convenience, if a hole be made in the pedeſtal, to place the ſpeculum exactly underneath, and thereby throw up the rays of light. The pocket-microſcope, thus mounted, ſays Mr Baker, "is as eaſy and pleaſant in its uſe; as fit for the moſt curious examination of the animalcules and ſalts in fluids, of the farinæ in vegetables, and of the circulation in ſmall animals; in ſhort, is as likely to make conſiderable diſcoveries in objects that have ſome degree of tranſparency, as any microſcope I have ever ſeen or heard of."

The braſs ſcroll A is now generally made to unſcrew into three parts, and pack with the microſcope and apparatus into the drawer of a mahogany pocket-caſe, upon the lid of which the ſcroll is made to fix when in uſe.

The opaque apparatus alſo, as above deſcribed, is applicable this way by reflection. It only conſiſts in turning the arm R (fig. 1.), with the magnifier over the concave ſpeculum below (fig. 2), or to receive the light as reflected obliquely from it: the ſilver ſpeculum ſcrewed into R will then reflect the light, which it receives from the glaſs ſpeculum, ſtrongly upon the object that is applied upon the wire T underneath.

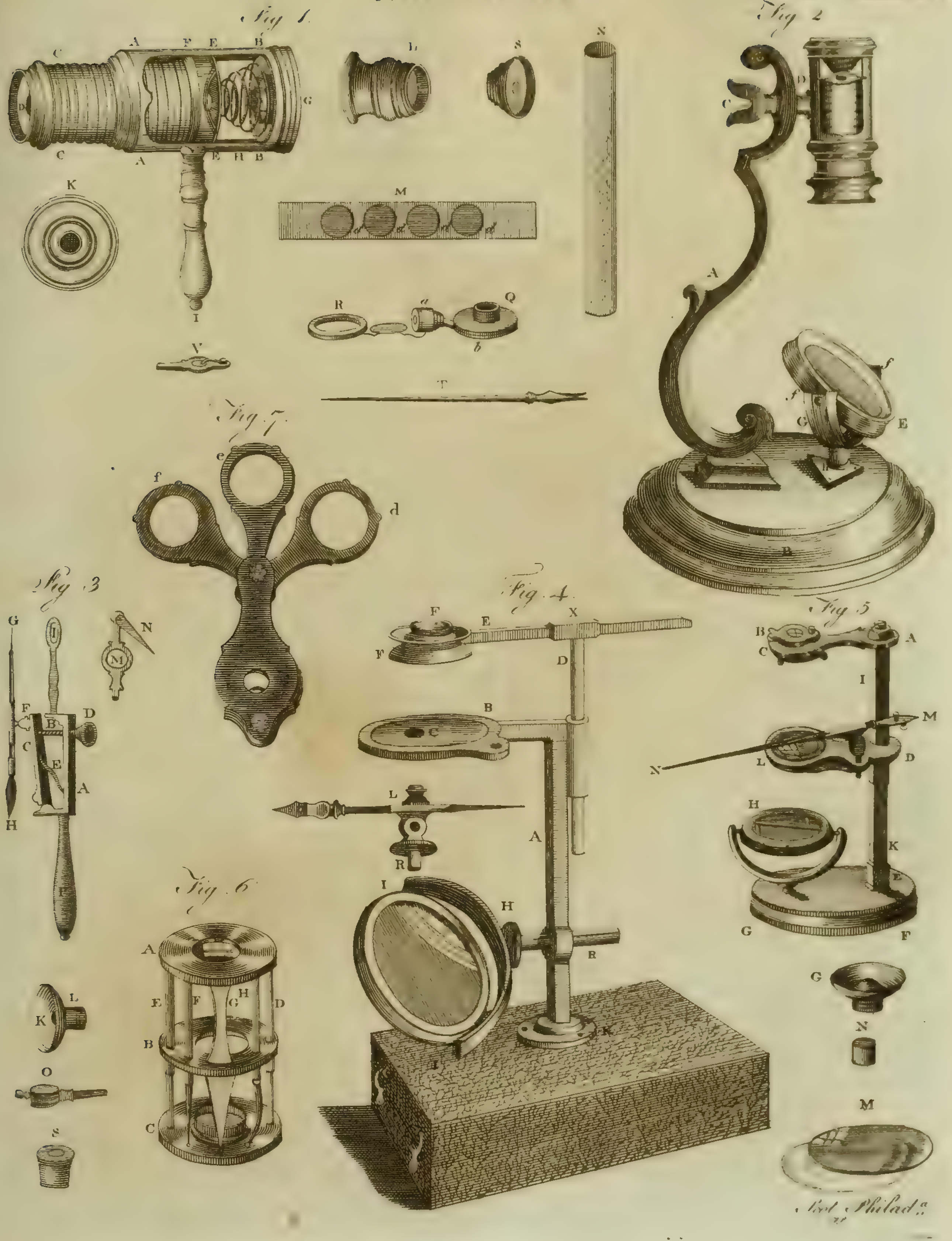
This microſcope, however, is not upon the moſt convenient conſtruction, in compariſon with others now made: it has been eſteemed for many years paſt from its popular name, and recommendation by its makers. Its portability is certainly a great advantage in its favour; but in moſt reſpects it is ſuperſeded by the microſcopes hereafter deſcribed.

Fig. 3.

3. *Microſcope for Opaque Objects, called the Single Opaque Microſcope.* This microſcope remedies the inconvenience of having the dark ſide of an object next the eye, which formerly was an unſurmountable objection to the making obſervations on opaque objects with any conſiderable degree of exactneſs or ſatisfaction: for, in all other contrivances commonly known, the nearneſs of the inſtrument to the object (when glaſſes that magnify much are uſed) unavoidably overſhadows it ſo much, that its appearance is rendered obſcure and indiſtinct. And, notwithſtanding ways have

MICROSCOPE.

Plate CCXCVII



Scot Philad.a

Microſcope

have been tried to point light upon an object, from the ſun or a candle, by a convex glaſs placed on the ſide thereof, the rays from either can be thrown upon it in ſuch an acute angle only, that they ſerve to give a confuſed glare, but are inſufficient to afford a clear and perfect view of the object. But this microſcope, by means of a concave ſpeculum of ſilver highly poliſhed in whoſe centre a magnifying lens is placed, ſuch a ſtrong and direct light is reflected upon the object, that it may be examined with all imaginable eaſe and pleaſure. The ſeveral parts of this inſtrument, made either of braſs or ſilver, are as follow.

Through the firſt ſide A, paſſes a fine ſcrew B, the other end of which is faſtened to the moveable ſide C. D is a nut applied to this ſcrew, by the turning of which the two ſides A and C are gradually brought together. E is a ſpring of ſteel that ſeparates the two ſides when the nut is unſcrewed. F is a piece of braſs, turning round in a ſocket, whence proceeds a ſmall ſpring tube moving upon a rivet; though which tube there runs a ſteel wire, one end whereof terminates in a ſharp point G, and the other with a pair of pliers H faſtened to it. The point and pliers are to thruſt into, or take up and hold, any inſect or object; and either of them may be turned upwards, as beſt ſuits the purpoſe. I is a ring of braſs, with a female ſcrew within it, mounted on an upright piece of the ſame metal; which turns round on a rivet, that it may be ſet at a due diſtance when the leaſt magnifiers are employed. This ring receives the ſcrews of all the magnifiers. K is a concave ſpeculum of ſilver, poliſhed as bright as poſſible; in the centre of which is placed a double convex lens, with a proper aperture to look through it. On the back of this ſpeculum a male ſcrew L is made to fit the braſs ring I, to ſcrew into it at pleaſure. There are four of theſe concave ſpecula of different depths, adapted to four glaſſes of different magnifying powers, to be uſed as the objects to be examined may require. The greateſt magnifiers have the leaſt apertures. M, is a round object-plate, one ſide of which is white and the other black: The intention of this is to render objects the more viſible, by placing them, if black, on the white ſide, or, if white, on the black ſide. A ſteel ſpring N turns down on each ſide to make any object faſt; and iſſuing from the object-plate is a hollow pipe to ſcrew it on the needle's point G. O, is a ſmall box of braſs, with a glaſs on each ſide, contrived to confine any living object, in order to examine it: this alſo has a pipe to ſcrew upon the end of the needle G. P, is a turned handle of wood, to ſcrew into the inſtrument when it is made uſe of. Q, a pair of braſs pliers to take up any object, or manage it with conveniency. R, is a ſoft hair-bruſh for cleaning the glaſſes, &c. S, is a ſmall ivory box for talcs, to be placed, when wanted, in the ſmall braſs-box O.

When you would view any object with this microſcope, ſcrew the ſpeculum, with the magnifier you think proper to uſe, into the braſs ring I. Place your object, either on the needle G in the pliers H, on the object plate M, or in the hollow braſs box O, as may be moſt convenient: then holding up your inſtrument by the handle P, look againſt the light through the magnifying lens; and by means of the nut D, together with the motion of the needle, by managing its lower end, the object may be turned about, raiſed, or depreſſed, brought nearer the glaſs, or removed farther from it, till you find the true focal diſtance, and the light be ſeen ſtrongly reflected from the ſpeculum upon the object, by which means it will be ſhown in a manner ſurpriſingly diſtinct and clear; and for this purpoſe the light of the ſky or of a candle will anſwer very well. Tranſparent objects may alſo be viewed by this microſcope; only obſerving, that when ſuch come under examination, it will not always be proper to throw on them the light reflected from the ſpeculum; for the light tranſmitted through them, meeting the reflected light, may together produce too great a glare A little practice, however, will ſhow how to regulate both lights in a proper manner.

Microſcope

4. *Ellis's ſingle and Aquatic Microſcope.* Fig. 4. repreſents a very convenient and uſeful microſcope, contrived by Mr John Ellis, author of An Eſſay upon Corallines, &c. To practical botaniſts, obſervers of animalcula, &c. it poſſeſſes many advantages above thoſe juſt deſcribed. It is portable, ſimple in its conſtruction, expeditious, and commodious in uſe. K, repreſents the box containing the whole apparatus: it is generally made of fiſh-ſkin; and on the top there is a female ſcrew, for receiving the ſcrew that is at the bottom of the pillar A: this is a pillar of braſs, and is ſcrewed on the top of the box. D, is a braſs pin which fits into the pillar; on the top of this pin is a hollow ſocket to recive the arm which carries the magnifiers; the pin is to be moved up and down, in order to adjuſt the lenſes to their focal or proper diſtance from the object. [N. B. In the repreſentations of this microſcope, the pin D is delineated as paſſing through a ſocket at one ſide of the pillar A; whereas it is uſual at preſent to make it paſs down a hole bored through the middle of the pillar.] E, the bar which carries the magnifying lens; it fits into the ſocket X, which is at the top of the pin or pillar D. This arm may be moved backwards and forwards in the ſocket X, and ſideways by the pin D; ſo that the magnifier, which is ſcrewed into the ring at the end E of this bar, may be eaſily made to traverſe over any part of the object that lies on the ſtage or plate B. FF is a poliſhed ſilver ſpeculum, with a magnifying lens placed at the centre thereof, which is perforated for this purpoſe. The ſilver ſpeculum ſcrews into the arm E, as at F. G, another ſpeculum, with its lens, which is of a different magnifying power from the former. H, the ſemicircle which ſupports the mirror I; the pin R, affixed to the ſemicircle H, paſſes thro' the hole which is towards the bottom of the pillar A. B, the ſtage, or the plane, on which the objects are to be placed; it fits into the ſmall dove-tailed arm which is at the upper end of the pillar DA. C, a plane glaſs, with a ſmall piece of black ſilk ſtuck on it; this glaſs is to lay in a groove made in the ſtage B. M, a hollow glaſs to be laid occaſionally on the ſtage inſtead of the plane glaſs C. L, a pair of nippers. Theſe are fixed to the ſtage by the pin at bottom; the ſteel wire of theſe nippers ſlides backwards and forwards in the ſocket, and this ſocket is moveable upwards and downwards by means of the joint, ſo that the poſition of the object may be varied at pleaſure. The object may be fixed in the nippers, ſtuck on the point, or affixed, by a little gum-water, &c. to the

ivory cylinder N, which occaſionally ſcrews to the point of the nippers.

To *uſe* this microſcope: Take all the parts of the apparatus out of the box; then begin by ſcrewing the pillar A to the cover thereof; paſs the pin R of the ſemicircle which carries the mirror thro' the hole that is near the bottom of the pillar A; puſh the ſtage into the dovetail at B, ſlide the pin into the pillar (ſee the N. B. above); then paſs the bar E through the ſocket which is at the top of the pin D, and ſcrew one of the magnifying lenſes into the ring at F. The microſcope is now ready for uſe: and though the enumeration of the articles may lead the reader to imagine the inſtrument to be of a complex nature, we can ſafely affirm that he will find it otherwiſe. The inſtrument has this peculiar advantage, that is difficult to put any of the pieces in a place which is appropriated to another. Let the object be now placed either on the ſtage or in the nippers L, and in ſuch manner that it may be as nearly as poſſible over the centre of the ſtage: bring the ſpeculum F over the part you mean to obſerve; then throw as much light on the ſpeculum as you can, by means of the mirror I, and the double motion of which it is capable; the light received on the ſpeculum is reflected by it on the objects. The diſtance of the lens F from the object is regulated by moving the pin D up and down, until a diſtinct view of it is obtained. The beſt rule is, to place the lens beyond its focal diſtance from the object, and then gradually to ſlide it down till the object appears ſharp and well defined. The adjuſtment of the lenſes to their focus, and the diſtribution of the light on the object, are what require the moſt attention: on the firſt the diſtinctneſs of the diviſion depends; the pleaſure ariſing from a clear view of the parts under obſervation is due to the modification of the light. No preciſe rule can be given for attaining accurately theſe points; it is from practice alone that ready habits of obtaining theſe neceſſary properties can be acquired, and with the aſſiſtance of this no difficulty will be found.

5. A very ſimple and convenient microſcope for botanical and other purpoſes, though inferior in many reſpects to that of Mr Ellils, was contrived by the late ingenious Mr Benjamin Martin, and is repreſented at fig. 5. where AB repreſents a ſmall arm ſupporting two or more magnifiers, one fixed to the upper part as at B, the other to the lower part of the arm at C; theſe may be uſed ſeparately or combined together. The arm AB is ſupported by the ſquare pillar IK, the lower end of which fits into the ſocket E of the foot FG; the ſtage DL is made to ſlide up and down the ſquare pillar; H, a concave mirror, for reflecting light on the object.—To *uſe* this microſcope, place the object on the ſtage reflect the light on it from the concave mirror, and regulate it to the focus, by moving the ſtage nearer to or farther from the lens at B. The ivory ſliders paſs through the ſtage; other objects may be fixed in the nippers MN, and then brought under the eye-glaſſes; or they may be laid on one of the glaſſes which fit the ſtage. The apparatus to this inſtrument conſiſts of three ivory ſliders; a pair of nippers; a pair of forceps; a flat glaſs and a concave ditto, both fitted to the ſtage.

The two laſt microſcopes are frequently fitted up with a toothed rack and pinion, for the more ready adjuſtment of the glaſſes to their proper focus.

6. *Withering's portable Botanic Microſcope.* Fig. 6. repreſents a ſmall botanical microſcope contrived by Dr Withering, and deſcribed by him in his *Botanical Arrangements.* It conſiſts of three braſs plates A, B, C, which are parallel to each other; the wires D and E are rivetted into the upper and lower plates, which are by this means united to each other; the middle plate or ſtage is moveable on the aforeſaid wires by two little ſockets which are fixed to it. The two upper plates each contain a magnifying lens, but of different powers; one of thoſe confines and keeps in their places the fine point F, the forceps G, and the ſmall knife H.—To *uſe* this inſtrument, unſcrew the upper lens, and take out the point, the knife, and the forceps; then ſcrew the lens on again, place the object on the ſtage, and then move it up or down till you have gained a diſtinct view of the object, as one lens is made of a ſhorter focus than the other; and ſpare lenſes of a ſtill deeper focus may be had if required. This little microſcope is the moſt portable of any. Its principal merit is its ſimplicity.

7. *Botanical Lenſes or Mgnifiers,* The haſte with which botaniſts, &c. have frequently occaſion to view objects, renders an extempore pocket-glaſs indiſpenſably neceſſary. The moſt convenient of any yet conſtructed, appears to be that contrived, in regard to the form of the mounting, by the late Mr Benjamin Martin; and is what he called a *Hand Megalaſcope*, becauſe it is well adapted for viewing all the larger ſort of ſmall objects univerſally, and by only three lenſes it has ſeven different magnifying powers.

Fig. 7. repreſents the caſe with the three frames and lenſes, which are uſually of 1, 1½, and 2 inches focus: they all turn over each other, and ſhut into the caſe and are turned out at pleaſure.

The three lenſes ſingly, afford three magnifying powers; and by combining two and two, we make three more; for *d* with *e* makes one, *d* with *f* another, and *e* with *f* a third; which, with the three ſingly, make ſix; and laſtly, all three combined together make another; ſo that upon the whole, there are ſeven powers of magnifying with theſe glaſſes only.

When the three lenſes are combined, it is better to turn them in, and look through them by the ſmall appertures in the ſides of the caſe. The eye in this caſe is excluded from extra light; the aberration of the ſuperfluous rays through the glaſſes is cut off; and the eye coincides more exactly with the common axes of the lenſes.

A very uſeful and eaſy kind of microſcope (deſcribed by Joblot, and which has been long in uſe), adapted chiefly for viewing, and confining at the ſame time, any living inſects, ſmall animals, &c. is ſhown at fig. 8 where A repreſents a glaſs tube, about 1¼ inches diameter and 2 inches high. B, a caſe of braſs or wood, containing a ſliding tube, with two or three magnifying glaſſes that may be uſed either ſeparately or combined. In the inſide, at the bottom, is a piece of ivory, black and white on oppoſite ſides, that is occaſionally removed, and admits a point to be ſcrewed into the centre. The cap unſcrews at D, to admit the placing of the object: the proper diſtance of the glaſſes from

Plate CCXCVIII

from the object is regulated by pulling up or down the braſs tube E at top containing the eye-glaſſes.

This microſcope is particularly uſeful for exhibiting the well-known curious *curculio imperialis*, vulgarly called the *diamond beetle*, to the greateſt advantage; for which, as well as for other objects, a glaſs bottom, and a poliſhed reflector at the top, are often applied to condenſe the light upon the object. In this caſe, the ſtand and braſs-bottom F, as ſhown in the figure, are taken away by unſcrewing.

9. *Mr Lyonet's Single Anatomical Diſſecting Microſcope.* Fig. 9. repreſents a curious and extremely uſeful microſcope, invented by that gentleman for the purpoſe of minute diſſections, and microſcopic preparations. This inſtrument muſt be truly uſeful to amateurs of the minutiæ of inſects, &c. being the beſt adapted of any for the purpoſes of diſſection. With this inſtrument Mr Lyonet made his very curious microſcopical diſſection of the *chenille de ſaule*, as related in his *Traité Anatomique de la chenille qui ronge le bois de ſaule*, 4to.

AB is the anatomical table, which is ſupported by a pillar NO; this is ſcrewed on the foot CD. The table AB is prevented from turning round by means of two ſteady pins. In this table or board there is a hole G, which is exactly over the centre of the mirror EF, that is to reflect the light on the object; the hole G is deſigned to receive a flat or concave glaſs, on which the objects for examination are to be placed.

RXZ is an arm formed of ſeveral balls and ſockets, by which means it may be moved in every poſſible ſituation; it is fixed to the board by means of the ſcrew H. The Laſt arm IZ has a female ſcrew, into which a magnifier may be ſcrewed as at Z. By means of the ſcrew H, a ſmall motion may be ocaſionally given to the arm IZ, for adjuſting the lens with accuracy to its focal diſtance from the object.

Another chain of balls is ſometimes uſed, carrying a lens to throw light upon the object; the mirror is likewiſe ſo mounted, as to be taken from its place at K, and fitted on a clamp, by which it may be fixed to any part of the table AB.

To uſe the Diſſecting Table:—Let the operator ſit with his left ſide near a light window; the inſtrument being placed on a firm table, the ſide DH towards the ſtomach, the obſervations ſhould be made with the left eye. In diſſecting, the two elbows are to be ſupported by the table on which the inſtrument reſts, the hands reſting againſt the board AB; and in order to give it greater ſtability (as a ſmall ſhake, though imperceptible to the naked eye, is very viſible in the microſcope), the diſſecting inſtruments are to be held one in each hand, between the thumb and two fore-fingers.

II. *Of* Double *Microſcopes, commonly called* Compound *Microſcopes.*

Double microſcopes are ſo called, from being a combination of two or more lenſes.

The particular and chief advantages which the compound microſcopes have over the ſingle, are, that the objects are repreſented under a larger field of view, and with a greater amplification of reflected light.

1. *Culpeper's Microſcope.* The compound microſcope, originally contrived by Mr Culpeper, is repreſented at fig. 10. It conſiſts of a large external braſs body A, B, C, D, ſupported upon three ſcrolls, which are fixed to the ſtage EF; the ſtage is ſupported by three larger ſcrolls, that are ſcrewed to the mahogany pedeſtal GH. There is a drawer in the pedeſtal which holds the apparatus. The concave mirror *I* is fitted to a ſocket in the centre of the pedeſtal. The lower part LMCD of the body forms an exterior tube, into which the upper part of the body ABLM ſlides, and may be moved up or down, ſo as to bring the magnifiers, which are ſcrewed on at N, nearer to or farther from the object.

To *uſe* this microſcope: Screw one of the buttons, which contains a magnifying lens, to the end N of the body; place the ſlider, with the objects, between the plates of the ſlider-holder. Then, to attain diſtinct viſion, and a pleaſing view of the object, adjuſt the body to the focus of the lens you are uſing, by moving the upper part gently up and down, and regulate the light by the concave mirror.

For opaque objects, two additional pieces muſt be uſed. The firſt is a cylindrical tube of braſs (repreſented at L, fig. 11.), which fits on the cylindrical part at N of the body. The ſecond piece is the concave ſpeculum *h*; this is to be ſcrewed to the lower end of the aforeſaid tube: the upper edge of this tube ſhould be made to coincide with the line which has the ſame number affixed to it as to the magnifier you are uſing; *ex. gr.* if you are making uſe of the magnifier marked 5, ſlide the tube to the circular line on the tube N that is marked alſo with N° 5. The ſlider-holder ſhould be removed when you are going to view opaque objects, and a plane glaſs ſhould be placed on the ſtage in its ſtead to receive the object; or it may be placed in the nippers, the pin of which fits into the hole in the ſtage.

The apparatus belonging to this microſcope conſiſts of the following particulars; *viz.* Five magnifiers each fitted in a braſs button; one of theſe is ſeen at N, fig. 10. Six ivory ſliders, five of them with objects. A braſs tube, to hold the concave ſpeculum. The concave ſpeculum in a braſs box. A fiſh pan. A ſet of glaſs tubes. A flat glaſs fitted to the ſtage. A concave glaſs fitted to the ſtage. A pair of forceps. A ſteel wire, with a pair of nippers at one end, and a point at the other. A ſmall ivory cylinder, to fit on the pointed end of the aforeſaid nippers. A convex lens, moveable in a braſs ſemicircle; this is affixed to a long braſs pin, which fits into a hole on the ſtage.

The conſtruction of the foregoing microſcope is very ſimple, and it is eaſy in uſe; but the advantages of the ſtage and mirror are too much confined for an extenſive application and management of all kinds of objects. Its greateſt recommendation is its cheapneſs; and to thoſe who are deſirous of having a compound microſcope at a low price, it may be acceptable.

2. *Cuff's Microſcope.* The improved microſcope next in order is that of Mr Cuff. Beſides remedying the diſadvantages abovementioned, it contains the addition of an adjuſting ſcrew, which is a conſiderable improvement, and highly neceſſary to the examination of objects under the beſt defined appearance from the glaſſes. It is repreſented at fig. 11. with the apparatus that uſually accompanies it. A, B, C, ſhows the body of this microſcope; which contains an eye-glaſs at A, a broad lens at B, and a mag-

a magnifier which is ſcrewed on at C. The body is ſupported by the arm D E, from which it may be removed at pleaſure. The arm D E is fixed on the ſliding bar F, and may be raiſed or depreſſed to any height within its limits. The main pillar *a b* is fixed in the box *b e*; and by means of the braſs foot *d* is ſcrewed to the mahogany pedeſtal X Y, in which is a drawer containing all the apparatus. O, is a milled-headed ſcrew, to tighten the bar F when the adjuſting ſcrew *c g* is uſed. *p q* Is the ſtage or plate which carries the objects; it has a hole at the centre *n*. G a concave mirror, that may be turned in any direction, to reflect the light of a candle, or the ſky, upon the object.

To *uſe* this microſcope: Screw the magnifier you intend to uſe to the end C of the body, place the ſlider-holder P in the hole *n*, and the ſlider with the object between the plates of the ſlider holder; ſet the upper edge of the bar D E to coincide with the diviſions which correſpond to the magnifier you have in uſe, and pinch it by the milled nut; now reflect a proper quantity of light upon the object, by means of the concave mirror G and regulate the body exactly to the eye and the focus of the glaſſes by the adjuſting ſcrew *c g*.

To view *opaque* objects, take away the ſlider-holder P, and place the object on a flat glaſs under the centre of the body, or on one end of the jointed nippers *o p*. Then ſcrew the ſilver concave ſpeculum *b* to the end of the cylinder L, and ſlide this cylinder on the lower part of the body, ſo that the upper edge thereof may coincide with the line which has the ſame mark with the magnifier that is then uſed; reflect the light from the concave mirror G to the ſilver ſpeculum, from which it will again be reflected on the object. The glaſſes are to be adjuſted to their focal diſtance as before directed.

The *apparatus* conſiſts of a convex lens H, to collect the rays of light from the ſun or a candle, and condenſe them on the object. L a cylindrical tube, open at each ſide, with a concave ſpeculum ſcrewed to the lower end *b*. P the ſlider-holder: this conſiſts of a cylindrical tube, in which an inner tube is forced upwards by a ſpiral ſpring; it is uſed to receive an ivory ſlider K, which is to be ſlid between the plates *b* and *i*. The cylinder P fits the hole *n* in the ſtage; and the hollow part at *k* is deſigned to receive a glaſs tube. R is a braſs cone, to be put under the bottom of the cylinder P, to intercept occaſionally ſome of the rays of light. S a box containing a concave and a flat glaſs, between which a ſmall living inſect may be confined: it is to be placed over the hole *n*. T a flat glaſs, to lay any occaſional object upon; there is alſo a concave one for fluids. O is a long ſteel wire. with a ſmall pair of pliers at one end, and a point at the other, deſigned to ſtick or hold objects; it ſlips backwards and forwards in the ſhort tube *o*; the pin *p* fits into the hole of the ſtage. W a little round ivory box, to hold a ſupply of talc and rings for the ſliders. V a ſmall ivory cylinder, that fits on the pointed end of the ſteel wire: it is deſigned for opaque objects. Light-coloured ones are to be ſtuck upon the dark ſide, and *vice verſa*. M a fiſh-pan, whereon to faſten a ſmall fiſh, to view the circulation of the blood: the tail is to be ſpread acroſs the oblong hole *k* at the ſmall end, and tied faſt, by means of a ribband fixed thereto; the knob *l* is to be ſhoved through the ſlit made in the ſtage, that the tail may be brought under the magnifier.

3. This microſcope has received ſeveral material improvements from Mr Martin, Mr Adams, &c. By an alteration, or rather an enlargement, of the body of the tube which contains the eye-glaſſes, and alſo of the eye-glaſſes, themſelves, the field of view is made much larger, the mirror below for reflecting light is made to move upon the ſame bar with the ſtage; by which means the diſtance of it from the ſtage may be very eaſily and ſuitably varied. A condenſing glaſs is applied upon the ſtage in the ſlider-holder, in order to modify and increaſe the light that is reflected by the mirrors below from the light of a candle or lamp. It is furniſhed alſo with two mirrors in one frame, one concave and and the other plane, of glaſs ſilvered; and by ſimply unſcrewing the body, the inſtrument, when deſired, may be converted into a ſingle microſcope. **Fig. 12.** is a repreſentation of the inſtrument thus improved; and the following is the deſcription of it, as given by Mr Adams in his Eſſays.

A B repreſents the body of the microſcope, containing a double eye-glaſs and a body glaſs: it is here ſhown as ſcrewed to the arm C D, from whence it may be occaſionally removed, either for the convenience of packing, or when the inſtrument is to be uſed as a ſingle microſcope.

The eye glaſſes and the body glaſſes are contained in a tube which fits into the exterior tube A B; by pulling out a little this tube when the microſcops is in uſe, the magnifying power of each lens is increaſed.

The body A B of the microſcope is ſupported by the arm C D; this arm is fixed to the main pillar C F, which is ſcrewed firmly to the mahogany pedeſtal G H; there is a drawer to this pedeſtal, which holds the apparatus.

N I S, The plate or ſtage which carries the ſlider-holder K L: this ſtage is moved up or down the pillar CF, by turning the milled nut M; this nut is fixed to a pinion, that works in a toothed rack cut on one ſide of the pillar. By means of this pinion, the ſtage may be gradually raiſed or depreſſed, and the object adjuſted to the focus of the different lenſes.

K L is a ſlider-holder, which fits into a hole that is in the middle of the ſtage N I S; it is uſed to confine and guide either the motion of the ſliders which contain the objects, or the glaſs tubes that are deſigned to confine ſmall fiſhes for viewing the circulation of the blood. The ſliders are to be paſſed between the two upper plates, the tubes through the bent plates.

L is a braſs tube, to the upper part of which is fixed the condenſing lens before ſpoken of; it fits into the under part of the ſlider-holder K L, and may be ſet at different diſtances from the object, according to its diſtance from the mirror or the candle.

O is the frame which holds the two reflecting mirrors, one of which is plane, the other concave. Theſe mirrors may be moved in various directions, in order to reflect the light properly, by means of the pivots on which they move, in the ſemicircle Q S R, and the motion of the ſemicircle itſelf on the pin S: the concave mirror generally anſwers beſt in the day-time; the plane mirror combines better with the condenſing lens,

MICROSCOPE.

Plate CCXCVIII

Fig. 8.

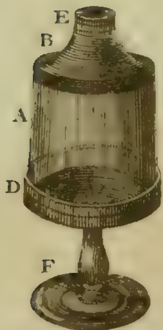


Fig. 9.

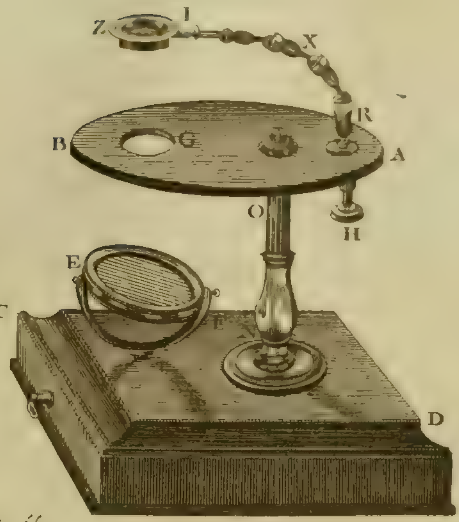


Fig. 10.

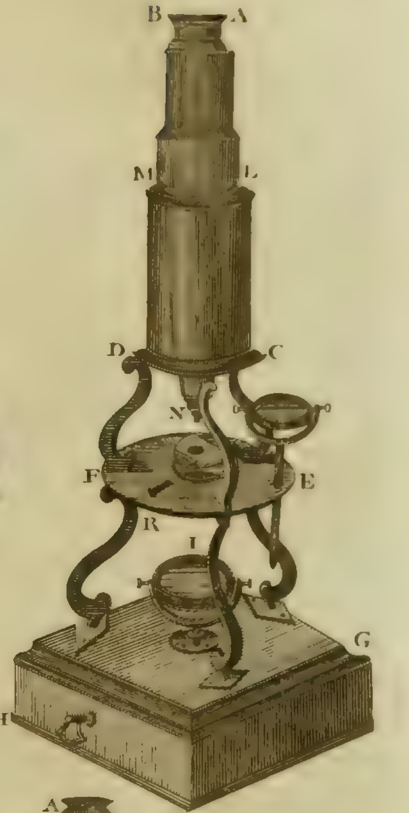


Fig. 11.

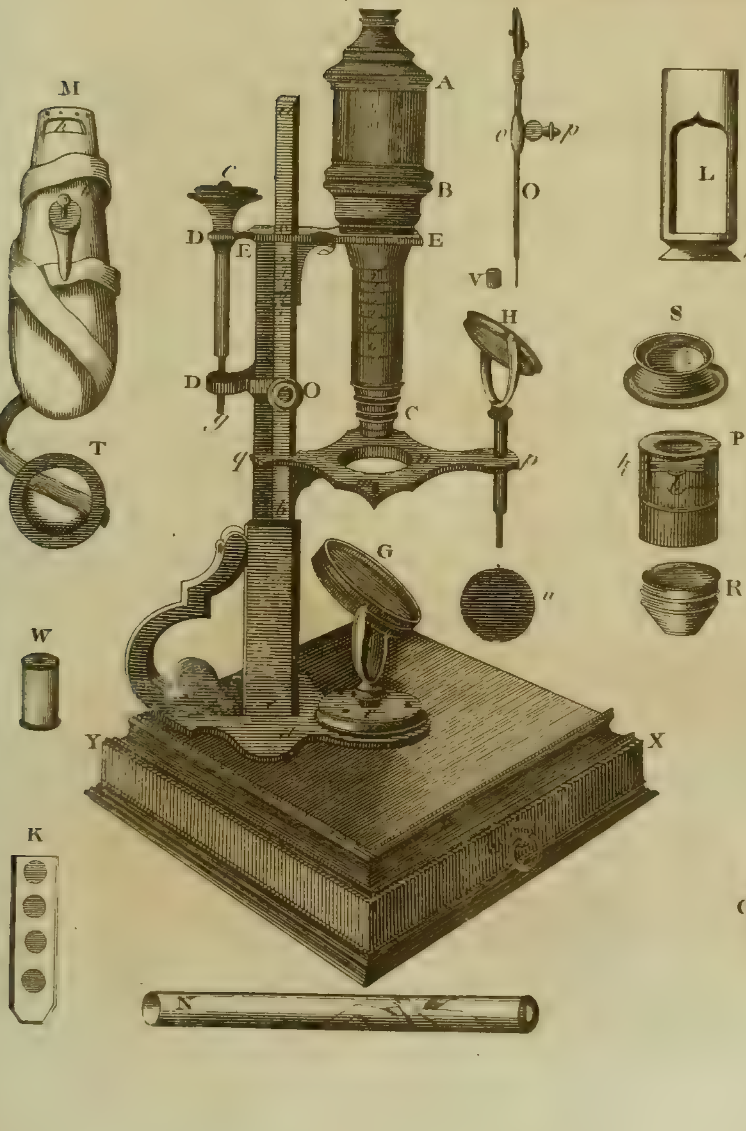
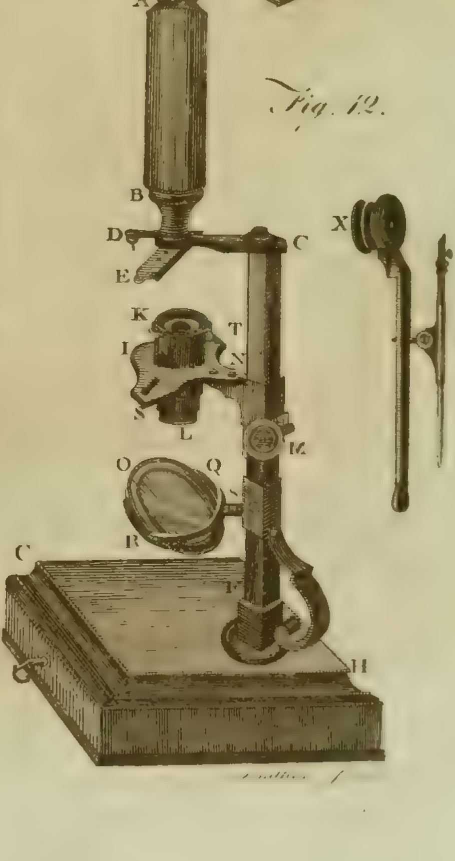


Fig. 12.



lens, and a lamp or candle. At D there is a ſocket for receiving the pin of the arm Q (fig. 31.), to which the concave ſpeculum, for reflecting light on opaque objects, is fixed. At S is a hole and ſlit for receiving either the nippers L (fig. 31. Pl. ccci.) or the fiſh-pan I; when theſe are uſed, the ſlider-holder muſt be removed. T, a hole to receive the pin of the convex lens M, fig. 31.

To *uſe* this microſcope: Take it out of the box. Screw the body into the round end of the upper part of the arm C D. Place the braſs ſliders, which contain the magnifiers, into the dove-tailed ſlit which is on the under ſide of the aforeſaid arm, as ſeen at E, and ſlide it forwards until the magnifier you mean to uſe is under the centre of the body: oppoſite to each magnifier in this ſlit there is a notch, and in the dove-tailed part of the arm C D there is a ſpring, which falls into the abovementioned notch, and thus makes each magnifier coincide with the centre of the body. Paſs the ivory ſlider you intend to uſe between the upper plates of the ſlider-holder KL, and then reflect as ſtrong a light as you can on the object by means of one of the mirrors; after this, adjuſt the object to the focus of the magnifier and your eye, by turning the milled ſcrew M, the motion of which raiſes and depreſſes the ſtage N I S. The degree of light neceſſary for each object, and the accuracy required in the adjuſtment of the lenſes to their proper focal diſtance from the object will be eaſily attained by a little practice.

When *opaque* objects are to be examined, remove the ſlider-holder, and place the object on a flat glaſs, or fix it to the nippers L, the pin of theſe fit into the hole on the ſtage; ſcrew the concave ſpeculum R into the arm Q (fig. 31.), and then paſs the pin of this arm through the ſocket D, fig. 12, the light is now to be reflected from the concave mirror to the ſilver ſpeculum, and from this down on the object. No exact rule can be given for reflecting the light on the object; we muſt therefore refer the reader to the mother of all aptneſs, practice. The ſpeculum muſt be moved lower or higher, to ſuit the focus of the different magnifiers and the nature of the object.

The foregoing directions apply equally to the uſing of this inſtrument as a *ſingle microſcope;* with this difference only, that the body A B is then removed, and the eye is applied to the upper ſurface of the arm CD, exactly over the magnifiers.

This microſcope is ſometimes made with the following *alterations*, which are ſuppoſed to make it ſtill more convenient and uſeful. The arm CD that carries the body and magnifiers is made both to turn on a pin, and to ſlide backwards and forwards in a ſocket at C; ſo that, inſtead of moving the objects below on the ſtage, and diſturbing them, the magnifiers are more conveniently brought over any part of the objects as deſired. The condenſing glaſs is made larger, and ſlides upon the ſquare bar CF quite diſtinct from the ſtage, like the mirrors below; and it is thereby made uſeful for any other objects that may be applied on glaſſes fitted to the ſtage, as well as thoſe put into the ſlider-holder K. It is thereby not confined to this ſtage alone, as in the preceding. When the body A B is taken away, the arm C D may be ſlipt away from its bar, with the magnifiers, and the forceps, wire, and joint, applied to it; and it thereby ſerves the purpoſe of a ſmall hand ſingle or opaque microſcope, for any object occaſionally applied to this wire. The magnifiers in the ſlider E are mounted in a wheel caſe, which perhaps prevents its being in the way ſo much as the long ſlider E before deſcribed.—This contrivance is repreſented at X, fig. 12.

4. *Martin's New Univerſal Compound Microſcope.*—This inſtrument was originally conſtructed by the late Mr B. Martin, and intended to compriſe all the uſes and advantages of the ſingle, compound, opaque, and aquatic microſcopes. The following is a deſcription of it as now made, with a few alterations, chiefly ſuggeſted (we are told) by Mr Jones of Holborn.

Plate CCXCIX.

Fig. 13. is a repreſentation of the inſtrument placed up for uſe. A, B, C, D, is the body of the microſcope: which conſiſts of four parts, viz. AB the eye-piece, or that containing the eye-glaſſes, and is ſcrewed into C, which is a moveable or ſliding tube on the top; this inner tube contains the body-glaſs ſcrewed into its lower part. D is the exterior tube or caſe, in which the other ſlides up and down in an eaſy and ſteady manner. This motion of the tube C is uſeful to increaſe or decreaſe the magnifying power of the body-glaſs when thought neceſſay, as beforementioned. E is a pipe or ſnout ſcrewed on to the body of the microſcope D, and at its lower part, over the ſeveral magnifying lenſes hereafter deſcribed. FGHI is the ſquare ſtem of the microſcope, upon which the ſtage R moves in an horizontal poſition, upwards or downward, by means of the fine rackwork of teeth and pinion. KL is a ſtrong ſolid joint and pillar, by which the poſition of the inſtrument is readily altered from a vertical one to an oblique or to a perfectly horizontal one, as may be required: it is thus well adapted to the eaſe of the obſerver either ſitting or ſtanding; and as it is very often convenient to view objects by direct unreflected light, when the ſquare ſtem FI is placed in an horizontal poſition for this purpoſe, the mirror T is then to be taken off in order to prevent the obſtruction of the rays. M is a circular piece of braſs, ſerving as a baſe to the pillar. NOP, the tripod or foot by which the whole body of the microſcope is ſteadily ſupported; it folds up when packed into the caſe. W is a braſs frame, that contains the condenſing lens, and acts in conjunction with the large concave and plane mirrors below at T; the reflected rays from which, either of the common light or of that of a candle or lamp, it agreeably modifies, and makes ſteady in the field of view.

The particulars of the apparatus to this microſcope are as follow: Q is a circular braſs box, containing ſix magnifiers or object lenſes, numbered 1, 2, 3, 4, 5, 6; the digits of which appear ſeverally through a ſmall round hole in the upper plate of it. To the upper ſide is fixed a ſmall circle of braſs, by which it is connected with, and ſcrewed into, the round end of the arm *a b c d;* which is a long piece of braſs, and moves through either by teeth or pinion, or not, as may be deſired, in *e f;* which is a ſocket on the upper part of the pillar, and admits, with a motion both eaſy and ſteady, the braſs arm. R is a fixed ſtage, upon which the objects to be viewed are to be placed: it is firmly faſtened to the ſquare-pillar, which is moved by the rack-work. In the middle is a large circular hole, for receiving concave glaſſes, with fluids, &c. It has alſo a ſliding ſpring-frame to faſten down ſlips of glaſs or other things: at *a b c* are three ſmall ſockets or holes, intended to receive ſeveral parts of the apparatus. S is the refractor, or illuminating lens, for converging the ſun's rays upon opaque objects laid upon the ſtage R. To this purpoſe it moves on a ſemicircle upon a long ſhank *g*, in a ſpring ſocket *h*, in the arm *i*; this arm moving every way by a ſtout pin *k* in the ſocket *a* of the ſtage. In this manner it is eaſily adjuſted to any poſition of the ſun, candle &c.—T, the reflecting-glaſs frame, containing a concave and plane ſpeculum, which is moved upon the ſquare pillar by the hand. The uſe of it is to illuminate all tranſparent objects that are applied to the ſtage above.

Fig. 14. n° 1. is an auxiliary moveable ſtage; which by means of a pin *k* is placed in the hole *a* of the ſtage R, and can be moved in an horizontal direction over the whole field of the ſtage. In this ſtage, there are three circular holes with ſhouldered bottoms; a large one in the middle, and on each ſide a ſmall one, for the reception of the three following neceſſary articles: n° 2. a watch-glaſs to be placed in the large hole, to hold fluids containing animalcules, &c.; a circular piece of ivory, n° 3. one ſide of which is black, the other white, to ſupport opaque objects of different contraſted colours; and circular plane and concave glaſſes, n° 4. for extemporaneous tranſparent objects.—The ſame uſe is made of the other ſmall hole as of the large one, only in a leſſer degree, to receive ſmall concave glaſſes, plates. &c.

N° 5. is the ſilvered ſpeculum, called a *Liberkhun*, which makes the ſingle opaque microſcope, by being ſcrewed to the ſlider *a b c d* (fig. 13.) in room of the box of lenſes Q, and the body AE above it. The chief uſe of this is to view very ſmall objects ſtrongly illuminated near the compounded focus of the mirror T (fig. 13.) N° 6. is the forceps or pliers, for holding ſuch kind of objects, and by which they can be applied very readily to the focus of the lens, in the liberkhun. They have a motion all ways by means of the ſpring ſocket *a*, the joint *b*, and the ſhank *c*: they are placed in the ſocket *c* of the fixed ſtage R (fig. 13.) N° 7. is a ſmall piece of ivory, to be placed upon the pointed end of the pliers: it is black upon one ſide, and white upon the other to receive opaque objects.

N° 8. is a liberkhun of a larger ſize than that firſt mentioned, with a hole in its centre; this is ſcrewed into n° 9. the hole *a* of a braſs ring, faſtened to a long wire *b*; which moves up and down in the ſpring ſocket *b* of the ſtage R, in which it alſo moves ſideways; and thus, with body AE above, forms an *aquatic compound microſcope* for ſhowing all ſorts of objects in water and other fluids placed under it in the watch-glaſs n° 2. on the ſtage.

N° 11. is a cone with a proper aperture *a* to exclude ſuperfluous light, that would diſturb a critical obſervation of a curious object; it is placed on the under ſide of the fixed ſtage R.

N° 12. is what is uſually called a bug-box, conſiſting of a concave glaſs with a plane one ſcrewed over it by means of which a bug, louſe, flea, &c. may be ſecured and viewed alive. It is to be placed on either of the ſtages R (fig. 13.), or n° 1 (fig. 14.)

N° 13. is the fiſh pin. In the long concave body *ab*, a fiſh may be ſo confined by the ribband *c*, that the tranſparent tail may be in part over the ſlit or hole at *a*. In this ſtate, it is placed on the ſtage R, with the pin *d* in the hole *c* of the ſtage, and moves freely and horizontally for viewing the circulation of the blood, &c.

N° 14. is the ſlider holder that is placed on the ſtage R: it receives the ſliders and tubes when filled with tranſparent objects, to be viewed either by the compound or ſingle microſcope.

N° 15. repreſents the ivory ſlider, to hold the objects between the tales as uſual.

N° 16. is a uſeful auxiliary ſlider framed in braſs: In this ſlider ſmall concave glaſſes are cemented; and a ſlip of plane glaſs ſlides over them; by which any ſmall living object, as mites, &c. may be confined without injury, and deliberately viewed.

N° 17. repreſents a ſet of glaſs tubes, three in number, one within another; they are uſeful for ſmall tadpoles, water-newts, eels, &c. when the circulation of the blood is to be viewed. There is a ſmall hole at one end of each tube, that ſerves to admit the air; for when they are filled with water, the other end is ſtopped with a cork.

N° 18. is a ſmall ivory box, containing ſpare tales and wires, to ſupply the ſliders with occaſionally.

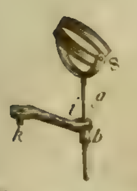
N° 19. a braſs cell or button, containing a very ſmall lens, properly ſet between two ſmall plates of braſs, that it may be brought very near to the object when viewed therewith as a ſingle microſcope. This magnifier is ſcrewed into the ſame hole as the wheel of ſix magnifiers Q are (fig. 13).

N° 20. is a lens, adapted to view and examine objects, by magnifying them ſufficiently, ſo as to be able to apply them to the microſcope for inſpection: on this account it is called the *explorator*.

The preceding are the chief articles of the apparatus, which on account of their being ſomewhat different from what is applied to other microſcopes, we have been thus particular in deſcribing. In uſing the microſcope, and while viewing objects by either the ſingle or compound inſtrument, the focal diſtances of the magnifiers are made perfectly exact by turning of the pinion at the nut *w*, in one way or the other, very gently in the teeth of the rack-work at X (fig. 13).

It is neceſſary that the centres of the object lenſes or magnifiers, the ſtage, and the mirrors at bottom, ſhould all be in a right line in the axis of the microſcope, when opaque objects are to be viewed, that are placed upon the ivory piece n° 7, or the forceps n° 6. and all other ſuch ſort of objects which are placed in the centre of the ſtage R, or ſlider-holder n° 14: But when aquatic or living objects, which require a great ſpace to move in, are to be viewed, then the horizontal motion at *e f* (fig. 13.) is made uſe of, and the view may be extended laterally over the whole of the diameter of the object or field of view; and by putting the arm *a b c d* forward or backward in its ſocket *e f*, the view is extended in the contrary direction equally well; and in this manner the whole

Fig. 13



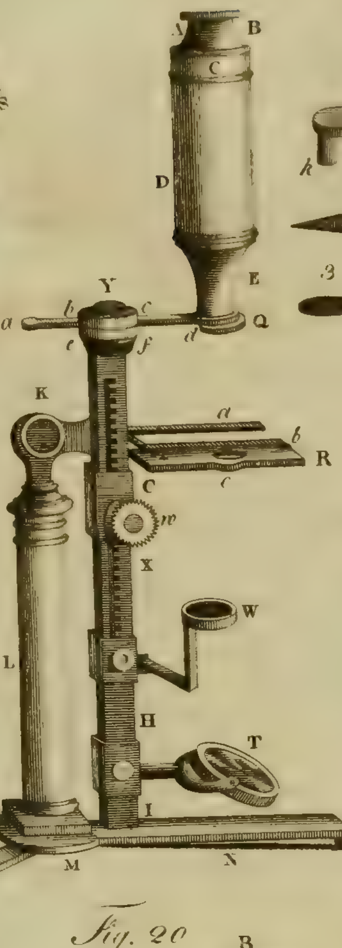


Fig. 14

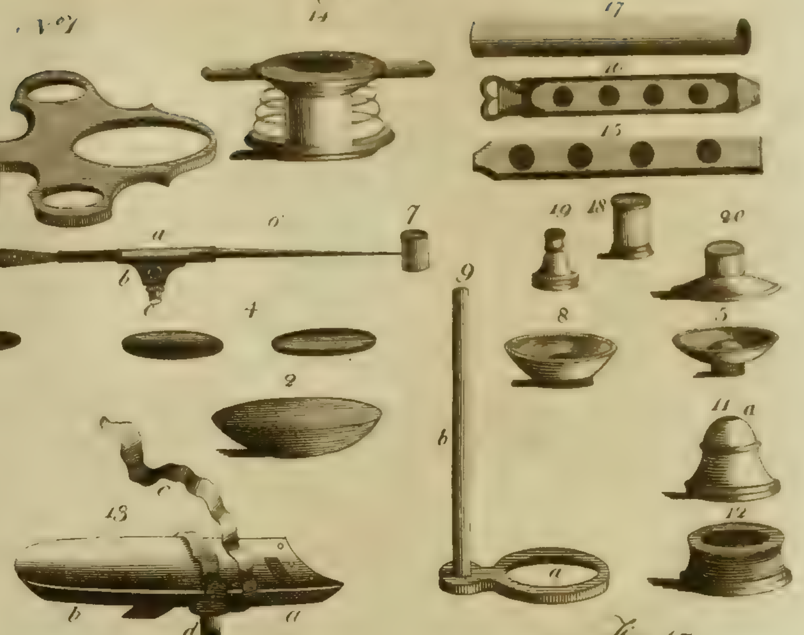


Fig. 15

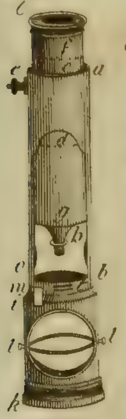


Fig. 16

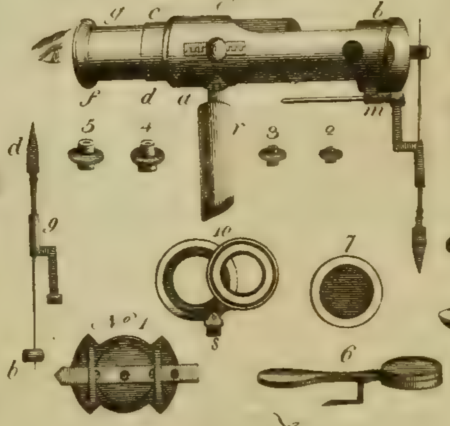


Fig. 17

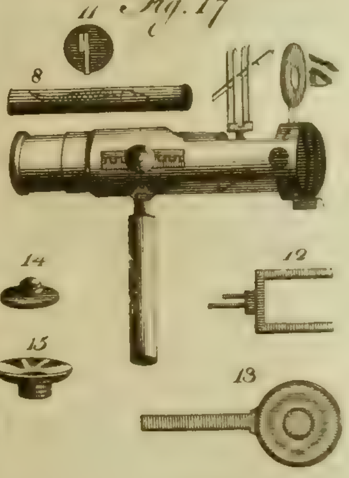


Fig. 20

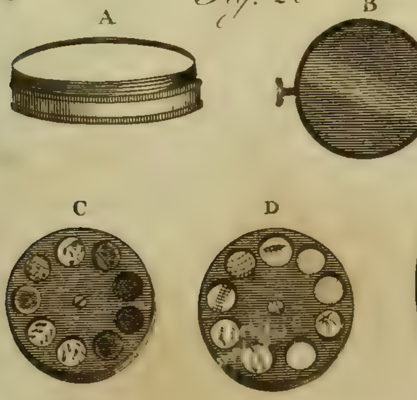


Fig. 19

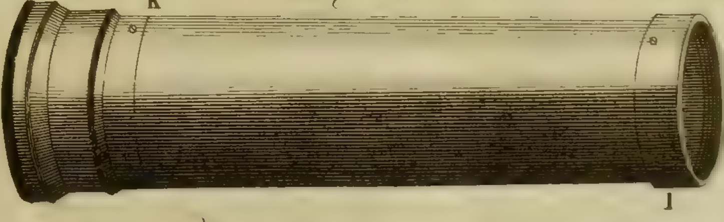
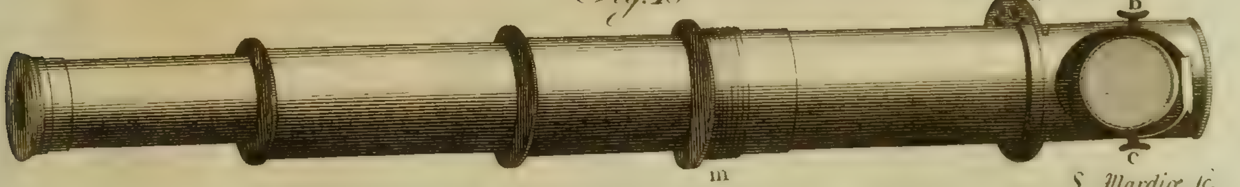


Fig. 18



S. Mardice fc.

of the objects may be viewed without the leaſt diſturbance.

As the braſs arm *abcd* may be brought to the height of three or four inches above the ſtage R; ſo, by means of the rack-work motion of the ſtage, a lens of a greater focal diſtance than the greateſt in the wheel Q may be occaſionally applied in place of the wheel, and thereby the larger kind of objects be viewed; the inſtrument becoming, in this caſe, what is called a *megalaſcope*.

In viewing moving living objects, or even fixed ones, when nice motions are requiſite, a rack-work and pinion is often applied to the arm *abcd*: the arm is cut out with teeth; and the pinion, as ſhown at Y, is applied to work it. This acts but in one direction; and in order to produce an equally neceſſary motion perpendicular to this, rack-work and pinion is applied tangent-wiſe to the ſtage, which is then jointed.

What has been related above reſpects the conſtruction of thoſe denominated *parlour* microſcopes, in contradiſtinction to thoſe which are portable: their dimenſions, however, have been conſiderably reduced by opticians, in order to render them fit for the pocket; and as they are for the moſt part conſtructed on nearly the ſame principles as thoſe which have been already deſcribed, what has been ſaid will ſufficiently inſtruct our readers in uſing any pocket microſcope whatever. Only it may be obſerved, that in thoſe reduced inſtruments, both the field of view and the magnifying power are proportionably diminiſhed.

We ſhall conclude the account of this ſort of microſcope with deſcriptions of a very portable pocket apparatus of microſcopic inſtruments, and of a new microſcopic pocket-teleſcope, both invented by the late Mr B. Martin, and ſince made by moſt inſtrument makers in London.

The former is repreſented at fig. 15. It conſiſts of two parts, viz. the body *ab*, and the pedeſtal *ik*, which is joined by a ſcrew at the part between *b* and *i*. It conſiſts of three cylindric tubes, viz. (1.) the exterior tube, or caſe *ab*; (2.) a middle tube *cb*; and (3.) the interior tube *fg*.—The middle tube *cd* is the adjuſter; and is connected with the outer tube by the rack-work of teeth and pinion, as ſhown at *e*: by which means it is moved up and down at pleaſure through the ſmalleſt ſpace, and carries with it the internal tube *fg*. The interior tube *fg* receives on its lower part at *b* the ſeveral capſules or boxes, 2, 3, 4, 5, (fig. 16.) which contain the object lenſes or magnifiers.

The method of *uſing* this compound microſcope in the perpendicular poſition, is as follows. The ſtage nº 1. is put within the exterior tube at *b*. Under the ſprings are applied the four ivory ſliders, which contain a variety of tranſparent objects; then move the interior tube *fg* up and down with the hand, till you diſcern the object in the ſlider, and there let it reſt. After this, turn the pinion at *e* very tenderly one way or the other, till you obtain a perfect view of the tranſparent objects properly illuminated, from a mirror contained in the pedeſtal or ſtand *ik*, ſuſpended upon, and moveable about, the points of two ſcrews (*ll*). Nº 6. (fig. 16.) repreſents a moveable ſtage, which is placed in the ſpring ſocket *m*. It contains a concave glaſs for the reception of animalcules in fluids; and has the advantage of bringing any part into view by moving the handle at *r*. If living and moving objects are required to be ſhown, they muſt be confined in the concave, by putting a glaſs cover, nº 7. upon the ſtage; and then a ſmall ſpider, a louſe, flea, bug, &c. may be ſeen, and the motion or circulation of the blood, &c. obſerved with ſurpriſing diſtinctneſs.

To view the circulation of the blood in the moſt eminent degree, it muſt be done by placing ſmall frogs, tadpoles, water-newts, fiſhes, &c. in a tube as repreſented nº 8. (fig. 17.); which tube is placed in the holes *o* in the oppoſite ſides of the caſe *ab*, fig. 15. in the lower part.—Nº 9. (fig. 16.) is a pair of pincers or pliers *d*, for holding any object; the other end of the ſteel wire is pointed to receive a piece of ivory *b*, with one end black and the other white, on which you ſtick objects of different hue: this alſo, when uſed, is placed in the ſpring ſocket *m*.

To uſe this inſtrument as a compound opaque, you ſcrew off the body part *ab*, and ſcrew to it the handle *r* (fig. 16.); by this means you may hold the microſcope in a horizontal poſition, as ſhown in the figure. The ſilver diſh or ſpeculum (which is contained in the bottom or baſe *k*, fig. 15), is then ſcrewed on at *b*. Nº 9. is placed in the ſpring-ſocket *m*, and adjuſted backward and forward in *m*, till the reflected light from the ſpeculum falls in a proper manner on the opaque object. Either of the 4 magnifiers, 2, 3, 4, 5, may be uſed, and brought to a proper focus, as before deſcribed by the tooth and pinion *e* fig. 15.) If you take off the opaque apparatus, and apply the ſtage nº 1. (fig. 16.) with an ivory ſlider, and at the end *b* ſcrew in either of the two lenſes nº 10. (which are diſtinguiſhed by the name of illuminators), the microſcope being held up to the light (and properly adjuſted), the whole field of view will be ſtrongly illuminated, and preſent a moſt pleaſing appearance of any tranſparent object. Theſe two convex lenſes are of different focuſes, and are to be uſed ſingly or together; nº 2. being the greateſt magnifier, will require the object to be ſtrongly illuminated, and of courſe both the lenſes muſt be uſed together. By candle-light, this method of viewing tranſparent objects will prove very entertaining; by ſcrewing the handle *r* into the part *s* of nº 10. it becomes a delightful hand megalaſcope for viewing flowers, foſſils, ſhells, &c.; and each lens, as before mentioned, having a different focus, produces two magnifying powers uſed ſingly, and when combined a third.

The manner of uſing this inſtrument as a ſingle microſcope (like Wilſon's) is repreſented in fig. 17. where the button or magnifier at each is to be ſcrewed off, and the circular piece nº 11. is ſcrewed in its place. This piece has a ſpring ſocket made to receive the ſlider holder nº 12. Nº 13. is a circular piece of braſs, with a long ſhank and ſpring, and is introduced through the outſide tube *ab* at *t*. Nº 2, 3, 4, 5, are ſcrewed occaſionally in the centre of this piece, and uſed as ſingle lenſes with ivory ſliders, &c. Nº 14. contains a lens of a great magnifying power. for viewing very minute objects: to render this inſtrument the moſt complete ſingle opaque microſcope, you have only to ſcrew into nº 13. the ſilver ſpeculum n° 15, which has a ſmall lens ſet in its centre. The ſlider-holder n° 12 is taken out of n° 11, and the pincers or nippers *d b*, being detached from the other part of n° 9. are paſſed through the long ſpring ſocket n° 11. and ready to receive any opaque body in the pincers or on the black or white piece of ivory. To the large ſcrew of n° 13. are applied the two lenſes n° 10. which make it the completeſt megalaſcope that can be deſired.

The handle *r* contains the four ivory ſliders with objects.

The ſhagreen caſe which contains this univerſal microſcope and its apparatus, is ſix inches long, three inches wide, two inches deep, and weighs together 16 ounces. "Thus (ſays Mr Martin) ſo ſmall, ſo light, ſo portable, and yet ſo univerſally complete, is this pocket microſcope apparatus, that you find nothing material in the large three-pillared microſcope, the opaque microſcope, Wilſon's ſingle microſcope, and the aquatic microſcope, all together, which you have not in this; beſide ſome very conſiderable advantages in regard to the field of view, &c. which they have not (A)."

This inventive artiſt having contrived a conſtruction of the compound microſcope ſo ſmall as to admit of being packed in a common walking cane, thought next of introducing the ſame inſtrument into the inſide of what he called his *Pocket Three-braſs drawer Achromatic Teleſcope.* The ſame eye-glaſſes that ſerve the purpoſe of a teleſcope, anſwer as the compound magnifier for viewing tranſparent opaque objects in a microſcope.

Fig. 18. 19. 20. repreſent the teleſcope ſeparated by unſcrewing it at *m*, in order that the whole of the neceſſary parts in uſe may be exhibited. Fig 19. repreſents the exterior tube, which is of mahogany, and its rims of braſs. It is detached from the reſt of the teleſcope, as not making any part of the microſcope. The braſs cover *k l*, that ſhuts up the object-glaſs of the teleſcope, is alſo the box which contains the two-wheel object-frames, and a ſmall plain reflecting mirror.

In fig. 20. A is the cover taken off, by unſcrewing the top part: The mirror B is taken out; and alſo, by unſcrewing the bottom part, the two circular wheels with the objects ſhown in C and D.

Fig. 18. is a repreſentation of the three internal braſs ſliding tubes of the teleſcope, which form the microſcopic part. The tubes are to be drawn out as ſhown in this figure; then, at the lower end of the large tube in the inſide, is to be pulled out a ſhort tube *b c*, that ſerves as a kind of ſtage to hold the wheels with objects, and ſupport the reflecting mirror. This tube ~~is~~ to be partly drawn out, and turned ſo that the circular hole that is pierced in it may coincide with a ſimilar hole that is cut in the exterior tube. This tube is repreſented as drawn out in the figure; and the mirror B placed therein, and the wheel with tranſparent objects. C (fig. 20.) repreſents the wheel with tranſparent objects, and D the wheel with opaque objects. They are both made of ivory; and turn round upon a centre braſs pin ſlit upon the top, which fits upon the edge of the tube; which tube is then to be puſhed up into the teleſcope tube, ſo that its lower end may reſt upon the upper edge of the wheel according to its view at *a* fig. 18.

In viewing the objects, the ſecond braſs tube of the teleſcope muſt be puſhed down, till its milled edge at top falls upon that of the exterior tube; taking care that the circular hole is duly placed to the exterior one. Theſe circular holes are not ſeen in fig. 18. being ſuppoſed in the oppoſite ſide, where the wheel is fixed. The adjuſtment for the focus is now only neceſſary; which is obtained by puſhing downwards or upwards the proper tube, till the object appears quite diſtinct. In viewing tranſparent objects, the inſtrument may be uſed in two poſitions; one vertical, when the light is to be reflected upon the object by the mirror; the other, by looking up directly againſt the light of a candle, common light, &c.; in which caſe the mirror muſt be taken away. In viewing opaque objects, the mirror is not uſed: but as much common light as poſſible muſt be admitted through the circular holes in the ſides of the tubes.

There is a ſpare hole in the tranſparent wheel, and alſo one in the opaque, to receive any occaſional object that is to be viewed. Any ſort of object whatſoever, may be viewed, by only puſhing up the microſcope tube into its exterior, and bringing the firſt eye-tube to its focal diſtance from the object.

The braſs tubes are ſo contrived, that they ſtop when drawn out to the full length: ſo that by applying one hand to the outſide tube, and the other to the end of the ſmalleſt tube, the teleſcope at one pull may be drawn out; then any of the tubes (that next to the eye is beſt) may be puſhed in gradually, till the moſt diſtinct view of the object be obtained.

The tubes all ſlide through ſhort braſs ſpring tubes, any of which may be unſcrewed from the ends of the ſliding tubes by means of the milled edges which project above the tubes, taken from each other, and the ſprings ſet clear if required.

III. *Of Solar Microſcopes.*

Plate CCC.

This inſtrument, in its principle, is compoſed of a tube, a looking-glaſs or mirror, a convex lens, and Wilſon's ſingle microſcope before deſcribed. The ſun's rays being reflected through the tube by means of the mirror upon the object, the image or picture of the object is thrown diſtinctly and beautifully upon a ſcreen of white paper or a white linen ſheet, placed at

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(A) Notwithſtanding the properties that have been aſcribed to the above inſtrument, and the praiſes beſtowed upon it by ſome, which induced us to admit ſo minute a deſcription; we muſt appriſe our readers, that it has been omitted in Mr Adam's enumeration: and upon inquiry we learn, that it has fallen into neglect among the moſt judicious opticians, being found too imperfect to ſerve the purpoſes of ſcience, and too complicated for the uſe of perſons who ſeek only entertainment.

at a proper diſtance to receive the ſame; and may be magnified to a ſize not to be conceived by thoſe who have not ſeen it: for the farther the ſcreen is removed, the larger will the object appear; inſomuch, that a louſe may thus be magnified to the length of five or ſix feet, or even a great deal more; though it is more diſtinct when not enlarged to above half that ſize.

The different forms in which the Solar Microſcope is conſtructed, are as follow.

I. The old conſtruction is repreſented in fig. 21. A is a ſquare wooden frame, through which paſs two long ſcrews aſſiſted by a couple of nuts 1, 1. By theſe it is faſtened firmly to a window ſhutter, wherein a hole is made for its reception; the two nuts being let into the ſhutter, and made faſt thereto. A circular hole is made in the middle of this frame to receive the piece of wood B, of a circular figure; whoſe edge, that projects a little beyond the frame, compoſes a ſhallow groove 2, wherein runs a catgut 3; which by twiſting round, and then croſſing over a braſs pully 4, (the handle whereof 5, paſſes through the frame), affords an eaſy motion for turning round the circular piece of wood B, with all the parts affixed to it. C is a braſs tube, which, ſcrewing into the middle of the circular piece of wood, becomes a caſe for the uncovered braſs tube D to be drawn backwards or forwards in. E is a ſmaller tube, of about one inch in length, cemented to the end of the larger tube D. F is another braſs tube, made to ſlide over the above deſcribed tube E; and to the end of this the microſcope muſt be ſcrewed, when we come to uſe it. 5. A convex lens, whoſe focus is about 12 inches, deſigned to collect the ſun's rays, and throw them more ſtrongly upon the object. G is a looking-glaſs of an oblong figure, ſet in a wooden frame, faſtened by hinges in the circular piece of wood B, and turning about therewith by means of the abovementioned cat-gut. H is a jointed wire partly braſs and partly iron; the braſs part whereof 6, which is flat, being faſtened to the mirror, and the iron part 7, which is round, paſſing through the wooden frame, enable the obſerver, by putting it backwards or forwards to elevate or depreſs the mirror according to the ſun's altitude. There is a braſs ring at the end of the jointed wire 8, whereby to meaſure it with the greater eaſe. The extremities of the cat-gut are faſtened to a braſs pin, by turning of which it may be braced up, if at any time it becomes too ſlack.

When this microſcope is employed, the room muſt be rendered as dark as poſſible; for on the darkneſs of the room, and the brightneſs of the ſunſhine, depend the ſharpneſs and perfection of your image. Then putting the looking-glaſs G through the hole in your window-ſhutter, faſten the ſquare frame A to the ſhutter by its two ſcrews and nuts 1, 1. This done, adjuſt your looking glaſs to the elevation and ſituation of the ſun, by means of the jointed wire H, together with the cat gut and pulley, 3, 4. For the firſt of theſe raiſing or lowering the glaſs, and the other inclining it to either ſide, there reſults a twofold motion, which may eaſily be ſo managed as to bring the glaſs to a right poſition, that is, to make it reflect the ſun's rays, directly through the lens 5, upon the paper ſcreen, and form thereon a ſpot of light exactly round. But though the obtaining a perfect circular ſpot of light upon the ſcreen before you apply the microſcope, is a certain proof that your mirror is adjuſted right, that proof muſt not always be expected: for the ſun is ſo low in winter, that if it ſhine in a direct line againſt the window, it cannot then afford a ſpot of light exactly round; but if it be on either ſide, a round ſpot may be obtained, even in December. As ſoon as this appears, ſcrew the tube C into the braſs collar provided for it in the middle of your wood-work, taking care not to alter your looking-glaſs: then ſcrewing the magnifier you chooſe to employ to the end of your microſcope in the uſual manner, take away the lens at the other end thereof, and place a ſlider, containing the objects to be examined, between the thin braſs plates, as in the other ways of uſing the microſcope.

Things being thus prepared, ſcrew the body of the microſcope over the ſmall end E of the braſs, tube F; which ſlip over the ſmall end E of the tube D, and pull out the ſaid tube D leſs or more as your object is capable of enduring the ſun's heat. Dead objects may be brought within about an inch of the focus of the convex lens 5; but the diſtance muſt be ſhortened for living creatures, or they will ſoon be killed.

If the light fall not exactly right, you may eaſily, by a gentle motion of the jointed wire and pulley, direct it through the axis of the microſcopic lens. The ſhort tube F, to which the microſcope is ſcrewed, renders it eaſy, by ſliding it backwards or forwards on the other tube E, to bring the objects to their focal diſtance; which will be known by the ſharpneſs and clearneſs of their appearance: they may alſo be turned round by the ſame means without being in the leaſt diſordered.

The magnifiers moſt uſeful in the ſolar microſcope are in general, the fourth fifth or ſixth. The ſcreen on which the repreſentations of the objects are thrown, is uſually compoſed of a ſheet of the largeſt elephant paper, ſtrained on a frame which ſlides up or down, or turns about at pleaſure on a round wooden pillar, after the manner of ſome fire-ſcreens. Larger ſcreens may alſo be made of ſeveral ſheets of the ſame paper paſted together on cloth, and let down from the ceiling with a roller like a large map.

"This microſcope (ſays Mr Baker) is the moſt entertaining of any; and perhaps the moſt capable of making diſcoveries in objects that are not too opaque: as it ſhows them much larger than can be done any other way. There are alſo ſeveral conveniences attending it, which no other microſcope can have: for the weakeſt eyes make uſe of it without the leaſt ſtraining or fatigue: numbers of people together may view any object at the ſame time; and by pointing to the particular parts thereof, and diſcourſing on what lies before them, may be able better to underſtand one another, and more likely to find out the truth, than in other microſcopes, where they muſt peep one after another, and perhaps ſee the object neither in the ſame light nor in the ſame poſition. Thoſe alſo, who have no ſkill in drawing, may, by this contrivance, eaſily ſketch out the exact figure of any object they have a mind to preſerve a picture of; ſince they need only faſten a paper on the ſcreen, and trace it out thereon either with a pen or pencil, as it appears before them. It is worth the while of thoſe who are deſirous of taking many draughts in this way, to get a frame, wherein a ſheet of paper may be put in or taken out at pleaſure; for if the paper be ſingle, the image of an object will be ſeen almoſt as plainly on the back as on the fore-ſide; and by ſtanding behind the ſcreen, the ſhade of the hand will not obſtruct the light in drawing, as it muſt in ſome degree when one ſtands before it." This conſtruction, however, has now become rather obſolete, and is ſuperſeded by the following.

II. *The improved Solar Microſcope as uſed with the improved ſingle Microſcope, with teeth and pinion.* Fig. 22. repreſents the whole form of the *ſingle microſcope;* the parts of which are as follows: ABCD the external tube; GHIK the internal moveable one; QM part of another tube within the laſt, at one end of which is fixed a plate of braſs hollowed in the middle, for receiving the glaſs tubes: there is alſo a moveable flat plate between which, and the fixed end of the ſecond tube, the ivory ſliders are to be placed. L, a part of the microſcope, containing a wire ſpiral ſpring, keeping the tube QM with its plates firm againſt the fixed part IK of the ſecond tube.

EF is the ſmall rack-work of teeth and pinion, by which the tube IG is moved gradually to or from the end AB, for adjuſting the objects exactly to the focus of different lengths. NO is a braſs ſlider, with ſix magnifiers; any one of which may eaſily be placed before the object. It is known when either of the glaſſes is in the centre of the eye-hole, by a ſmall ſpring falling into a notch in the ſide of the ſlider, made againſt each of the glaſſes. Thoſe parts of the apparatus, fig. 14. (Pl.cccxix.) marked nº 15, 16, 17, 18, 19, 20, 21. and 22. are made uſe of here to this microſcope. GH is a braſs cell, which holds an illuminating glaſs for converging the ſun's beams or the light of a candle ſtrongly upon the objects. The aperture of the glaſs is made greater or leſs, by two circular pieces of braſs, with holes of different ſizes, that are ſcrewed ſeparately over the ſaid lens. But at times, objects appear beſt when the microſcope is held up to the common light only, without this glaſs. It is alſo taken away when the microſcope is applied to the apparatus now to be deſcribed.

Fig. 23. repreſents the apparatus, with the ſingle microſcope ſcrewed to it, which conſtitutes the *Solar Microſcope.* AB is the inner moveable tube, to which the ſingle microſcope is ſcrewed. CD, is the external tube, containing a condenſing convex glaſs at the end D, and is ſcrewed into the plate EF, which is cut with teeth at its circumference, and moved by the pinion I, that is fixed with the plate GH. This plate is ſcrewed faſt againſt the window-ſhutter, or board fitted to a convenient window of a darkened room, when the inſtrument is uſed. KL is a long frame, fixed to the circular plate EF; containing a looking-glaſs or mirror for reflecting the ſolar rays through the lens in the body of the tube D. O is a braſs milled head, faſtened to a worm or endleſs ſcrew; which on the outſide turns a ſmall wheel, by which the reflecting mirror M is moved upwards or downwards.

In *uſing* this microſcope, the ſquare frame GH is firſt to be ſcrewed to the window-ſhutter, and the room well darkened: which is beſt done by cutting a round hole of the ſize of the moveable plate EF, that carries the reflector, in the window-ſhutter or board; and, by means of two braſs nuts *a a,* let into the ſhutter to receive the ſcrews PP, when placed through the holes in the ſquare frame GH, at the two holes QQ; which will firmly faſten the microſcope to the ſhutter, and is eaſily taken away by only unſcrewing the ſcrews PP.

The white paper ſcreen, or white cloth, to receive the images, is to be placed ſeveral feet diſtant from the window: which will make the repreſentations the larger in proportion to the diſtance. The uſual diſtances are from 6 to 16 feet,

The frame KL, with its mirror M, is to be moved by turning the pinion I, one way or the other, till the beams of the ſun's light come through the hole into the room: then, by turning of the worm at O, the mirror muſt be raiſed or depreſſed till the rays become perfectly horizontal, and go ſtraight acroſs the room to the ſcreen. The tube CD, with its lens at D, is now to be ſcrewed into the hole of the circular plate EF: by this glaſs the rays will be converged to a focus; and from thence proceed diverging to the ſcreen, and there make a large circle of light. The ſingle microſcope, fig. 22. is to be ſcrewed on to the end AB (fig. 23) of the inner tube; and the ſlider NO, with either of the lenſes marked 1, 2, 3, 4, 5, or 6, in the centre of the hole at the end AB. This will occaſion a circle of light upon the ſcreen much larger than before. The ſlider or glaſs-tube, with the objects to be viewed, is to be placed between the plates at IK againſt the ſmall magnifier, and moved at pleaſure. By ſhifting the tube AB in or out, you may place the object in ſuch a part of the condenſed rays as ſhall be ſufficient to illuminate it, and not ſcorch or burn it; which will generally require the glaſs to be about one inch diſtant from the focus. It now remains only to adjuſt the object, or to bring it ſo near to the magnifier that its image formed upon the ſcreen ſhall be the moſt diſtinct or perfect: and it is effected by gently turning the pinion F, fig. 22, a ſmall matter one way or the other. If the object be rather large in ſize, the leaſt magnifiers are generally uſed, and *vice verſa.*

Nº 1. is the greateſt magnifier, and nº 6. the leaſt, in the braſs ſlider NO. But, if deſired, ſingle lenſes of greater magnifying powers are made: and they are applied, by being ſcrewed to the end AB, fig. 22. and the braſs ſlider N O is then taken away.

The ſame object may be variouſly magnified, by the lenſes ſeverally applied to it; and the degree of magnifying power is eaſily known by this rule: *As the diſtance of the object is to that of its image from the magnifier; ſo is the length and breadth of the object to that of the image.*

Inſtead of the braſs ſliders with the lenſes NO, there is ſometimes ſcrewed a lens of a large ſize, and longer focal diſtance: the inſtrument is then converted into a *megalaſcope;* and is adapted for viewing the larger kind of objects contained in large ſliders, ſuch as is repreſented at R. And in the ſame manner, ſmall objects of entertainment, painted upon glaſs like the ſliders of a magic lanthorn, are much magnified, and repreſented upon the ſame ſcreen.

The ſolar microſcopes juſt deſcribed are capable only

Fig. 25.

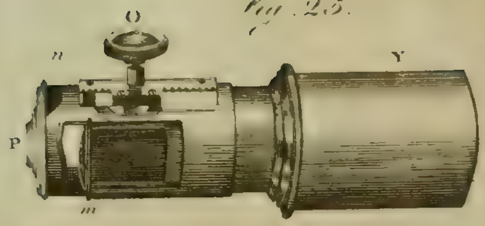


Fig. 21.

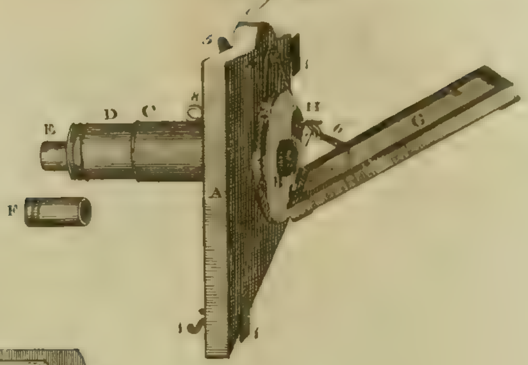


Fig. 23.

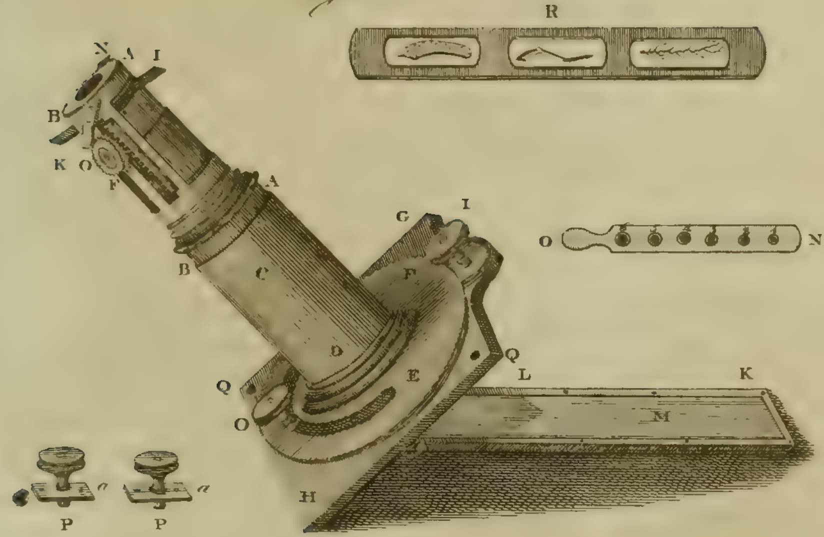


Fig. 22.

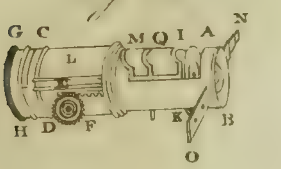
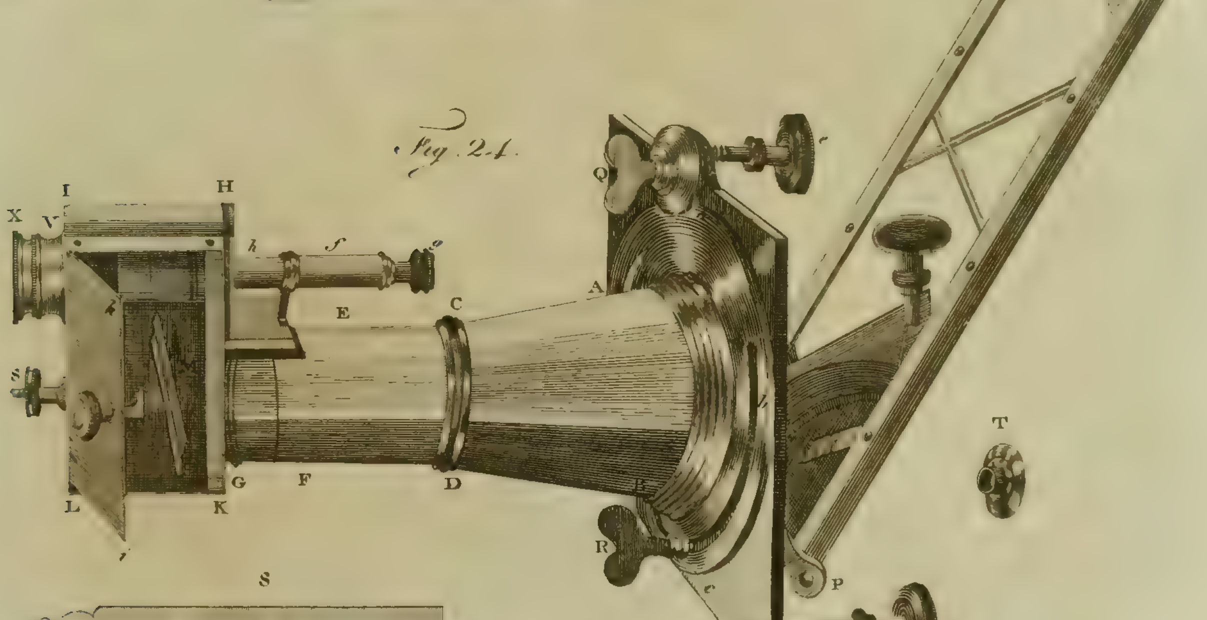


Fig. 24.



Scot· Philad.ª
sc.

ly of magnifying tranſparent objects; for which purpoſe the laſt inſtrument is extremely well adapted. But as opaque objects form the moſt conſiderable part of the curious collections in the works of art as well as nature, a ſolar microſcope for this purpoſe was a long time wanted.—For ſeveral years previous to 1774, the late Mr Martin made ſeveral eſſays towards the conſtruction of ſuch an inſtrument; and at laſt completed one about the time juſt mentioned, which he named,

III. *The Opaque Solar Microſcope.* With this inſtrument (to uſe his own words) all *opaque* objects, whether of the animal, vegetable, or mineral kingdom, may be exhibited in great perfection, in all their native beauty: the lights and ſhades, the prominences and cavities, and all the varieties of different hues, tints and colours; heightened by reflection of the ſolar rays condenſed upon them."—*Tranſparent objects* are alſo ſhown with greater perfection than by the common ſolar microſcope.

Fig. 24. repreſents the ſolar opaque microſcope, mounted for exhibiting opaque objects.

Fig. 25. is the ſingle tooth-and-pinion microſcope, as before, which is uſed for ſhowing tranſparent objects; the cylindrical tube Y thereof being made to fit into the tube FE of the ſolar microſcope.

ABCDEF, (fig. 24.) repreſents the body of the ſolar microſcope; one part thereof, ABCD, is conical; the other, CDEF, is cylindrical. The cylindrical part receives the tube G of the opaque box, or the tube Y of the ſingle microſcope. At the large end AB of the conical part, there is a lens to receive the rays from the mirror, and refract them towards the box HIKL. NOP is a braſs frame; which is fixed to the moveable circular plate *a b c*: in this frame there is a plane mirror, to reflect the ſolar rays on the aforementioned lens. This mirror may be moved into the moſt convenient poſition for reflecting the light, by means of the nuts Q and R. By the nut Q it may be moved from eaſt to weſt; and it may be elevated or depreſſed by the nut R. *d e*, Two ſcrews to faſten the microſcope to a window-ſhutter. The box for opaque objects is repreſented at HIKL: it contains a plane mirror M, for reflecting the light which it receives from the large lens to the object, and thereby illuminating it; S is a ſcrew to adjuſt this mirror, or place it at a proper angle for reflecting the light. VX, two tubes of braſs, one ſliding within the other, the exterior one in the box HIKL; theſe carry the magnifying lenſes: the interior tube is ſometimes taken out, and the exterior one is then uſed by itſelf. Part of this tube may be ſeen in the plate within the box HIKL. At H there is a braſs plate, the back part of which is fixed to the hollow tube *h*, in which there is a ſpiral wire, which keeps the plate always bearing againſt the ſide H of the braſs box HIKL. The ſliders, with the opaque objects, paſs between this plate and the ſide of the box; to put them there, the plate is to be drawn back by means of the nut *g*: *i k* is a door to one ſide of the opaque box. The foregoing pieces conſtitute the ſeveral parts neceſſary for viewing opaque objects. We ſhall now proceed to deſcribe the ſingle microſcope, which is uſed for tranſparent objects: but in order to examine theſe, the box HIKL muſt be firſt removed, and in its place we muſt inſert the tube Y of the ſingle microſcope that we are now going to deſcribe.

Fig. 25. repreſents a large tooth-and-pinion microſcope: at *m*, within the body of this microſcope, are two thin plates, that are to be ſeparated, in order to let the ivory ſliders paſs between them; they are preſſed together by a ſpiral ſpring, which bears up the under plate, and forces it againſt the upper one.

The ſlider S (under fig. 24.), which contains the magnifiers, fits into the hole *n*; and any of the magnifiers may be placed before the object, by moving the aforeſaid ſlider; when the magnifier is at the centre of the hole P, a ſmall ſpring falls into one of the notches which is on the ſide of the ſlider.

Under the plate *m* are placed two lenſes, for enlarging the field of view on the ſcreen: the ſmaller of the two is fixed in a piece of braſs, and is neareſt the plate *m*; this is to be taken out when the magnifiers, N° 4, 5, or 6 are uſed, or when the megalaſcope lens T (fig. 24.) is uſed; but is to be replaced for N° 1, 2, 3.

This microſcope is adjuſted to the focus by turning the milled nut O.

To *uſe* the ſolar microſcope:—Make a round hole in the window-ſhutter, a little larger than the circle *a b c*; paſs the mirror ONP through this hole, and apply the ſquare plate to the ſhutter; then mark with a pencil the places which correſpond to the two holes through which the ſcrew is to paſs; take away the microſcope, and bore two holes at the marked places, ſufficiently large to let the milled ſcrews *d e* paſs through them.

The ſcrews are to paſs from the outſide of the ſhutter, to go through it; and being then ſcrewed into their reſpective holes in the ſquare plate, they will when ſcrewed home, hold it faſt againſt the inſide of the ſhutter, and thus ſupport the microſcope.

Screw the conical tube ABCD to the circle *a b c*, and then ſlide the tube G of the opaque box into the cylindrical part CDEF of the body, if opaque objects are to be examined; but if they be tranſparent objects you mean to ſhow, then place the tube Y within the tube CDEF.

The room is to be darkened as much as poſſible, that no light may enter but what paſſes through the body of the microſcope; for, on this circumſtance, together with the brightneſs of the ſun ſhine, the perfection and diſtinctneſs of the image in a great meaſure depend.

When the microſcope is to be uſed for opaque objects, 1. Adjuſt the mirror NOP, ſo as to receive the ſolar rays, by means of the two finger ſcrews or nuts, Q R; the firſt, Q, turns the mirror to the right or left; the ſecond R, raiſes or depreſſes it; this you are to do till you have reflected the ſun's light through the lens at AB ſtrongly upon a ſcreen of white paper placed at ſome diſtance from the window, and formed thereon a round ſpot of light. An unexperienced obſerver will find it more convenient to obtain the light by forming this ſpot before he puts on either the opaque box or the tooth-and-pinion microſcope.

Now put in the *opaque* box, and place the object between the plates at H; open the door *i k*, and adjuſt the mirror M till you have illuminated the object ſtrongly. If you cannot effect this by the ſcrew S, you muſt move the ſcrews Q, R, in order to get the light reflected ſtrongly from the mirror NOP, or the mirror M, without which the latter cannot illuminate the object.

The object being ſtrongly illuminated, ſhut the door *i k*, and a diſtinct view of the object will ſoon be obtained on your ſcreen, by adjuſting the tubes VX, which is effected by moving them backwards or forwards.

A round ſpot of light cannot always be procured in northern latitudes, the altitude of the ſun being often too low; neither can it be obtained when the ſun is directly perpendicular to the front of the room.

As the ſun is continually changing its place, it will be neceſſary, in order to keep his rays full upon the object, to keep them continually directed thro' the axis of the inſtrument, by the two ſcrews Q and R.

To view *tranſparent* objects, remove the opaque box, and inſert the tube Y, fig. 25. in its place; put the ſlider S into its place at *n*, and the ſlider with the objects between the plates at *m*; then adjuſt the mirror NOP, as before directed by the ſcrews Q, R, ſo that the light may paſs through the object; regulate the focus of the magnifier by the ſcrew O. The moſt pleaſing magnifiers in uſe are the fourth and fifth.

The ſize of the object may be increaſed or diminiſhed, by altering the diſtance of the ſcreen from the microſcope: five or ſix feet is a convenient diſtance.

To examine tranſparent objects of a larger ſize, or to render the inſtrument what is uſually called a *megalaſcope*, take out the ſlider S from its place at *n*, and ſcrew the button T (fig. 24.) into the hole at P, fig. 25 and remove the glaſs which is under the plate at *m*, and regulate the light and focus agreeable to the foregoing directions.

N. B. At the end of the tube G there is a lens for increaſing the denſity of the rays, for the purpoſe of burning or melting any combuſtible or fuſible ſubſtance: this lens muſt be removed in moſt caſes leſt the objects ſhould be burnt. The intenſity of the light is alſo varied by moving this tube backwards or forwards.

Apparatus of the Opaque Solar Microſcope.—The large ſquare plate and mirror; the body of the microſcope; the opaque box and its tube; the tooth-and pinion microſcope; the ſlider with the magnifiers; the megalaſcope magnifier; the two ſcrews *d* and *e*; ſome ivory ſliders; ſome ſliders with opaque objects; a braſs frame, with a bottom of ſoft deal to ſtick any object on; a braſs cylinder K (fig. 31.), for confining opaque objects.

IV. *The* CAMERA OBSCURA, *or* LUCERNAL, *Microſcope.*

—The great facility with which objects can be repreſented on paper or a rough glaſs in the camera obſcura, and copies drawn from them by any perſon though unſkilled in drawing, evidently ſuggeſted the application of the microſcope to this inſtrument. The greateſt number of experiments that appear to have been made with this view, were by the late Mr Martin and Mr Adams; the former of whom frequently applied the microſcope to the portable camera and with much effect and entertainment. But theſe inſtruments being found to anſwer only with the aſſiſtance of the ſun, Mr Adams directed his experiments to the conſtruction of an inſtrument of more extended utility, which could be equally employed in the day-time and by night. He accordingly ſucceeded ſo far as to produce, by *candle-light* the images of objects refracted from a ſingle magnifier upon one or two large convex lenſes (of about five inches or upwards in diameter), at the end of a pyramidal ſhaped box, in a very pleaſing and magnified appearence, ſo as to give opaque objects as well as tranſparent ones the utmoſt diſtinctneſs of repreſentation; but ſtill the light of a candle or lamp was found generally inſufficient to throw the requiſite degree of illumination upon the objects. The invention of what is called *Argand's lamp*, within theſe few years offered a complete remedy for this defect, by the intenſity and ſteadineſs of its light. This did not eſcape the preſent Mr Adams (ſon of the former), who immediately applied it; and who had likewiſe ſo altered and improved his father's inſtrument, both in conſtruction and form, as to render it altogether a different one, and far more perfect and uſeful.

The advantages and properties of this excellently conceived inſtrument are numerous and important. "As the far greater part of the objects which ſurround us are opaque (ſays our author), and very few are ſufficiently tranſparent to be examined by the common microſcopes, an inſtrument that could be readily applied to the examination of opaque objects has always been a deſideratum. Even in the examination of tranſparent objects, many of the fine and more curious portions are loſt and drowned, as it were, in the light which muſt be tranſmitted through them; while different parts of the ſame object appear only as dark lines or ſpots, becauſe they are ſo opaque as not to permit any light to paſs through them. Theſe difficulties, as well as many more, are obviated in the lucernal microſcope; by which opaque objects of various ſizes may be ſeen with eaſe and diſtinctneſs: the beautiful colours with which moſt of them are adorned, are rendered more brilliant, without changing in the leaſt the real tint of the colour; and the concave and convex parts retain alſo their proper form.—The facility with which all opaque objects are applied to this inſtrument, is another conſiderable advantage, and almoſt peculiar to itſelf; as the texture and configuration of the more tender parts are often hurt by previous preparation, every object may be examined by this inſtrument, firſt as opaque, and afterwards (if the texture will admit of it) as tranſparent.—The lucernal microſcope does not in the leaſt fatigue that eye; the object appears like nature itſelf, giving eaſe to the ſight and pleaſure to the mind: there is alſo, in the uſe of this inſtrument, no occaſion to ſhut the eye which is not directed to the object. A further advantage peculiar to this microſcope is, that by it the outlines of every object may be taken, even by thoſe who are not accuſtomed to draw; while thoſe who can draw well will receive great aſſiſtance, and execute their work with more accuracy and in leſs time than they would otherwiſe have been able to have performed it. Tranſparent objects as well as opaque may be copied in the ſame manner. The inſtrument may be uſed at any time of the day, but the beſt effect is by night; in which reſpect it has a ſuperiority over the ſolar microſcope, as that inſtrument can only be uſed when the ſun ſhines.

Tranſparent objects may be examined with the lucernal microſcope in three or four different modes, from a blaze of light almoſt too great for the eye to bear, to that which is perfectly eaſy to it: And by the addition of a tin lanthorn to the apparatus, may be thrown on a ſcreen, and exhibited at one view to a large company, as by the ſolar microſcope.

We ſhall now proceed to the deſcription of the inſtrument and apparatus as given by Mr Adams.

Fig. 26. repreſents the improved *Lucernal Microſcope*, mounted to view opaque objects. ABCD is a large mahogany pyramidal box, which forms the body of the microſcope, it is ſupported firmly on the braſs pillar FG, by means of the ſocket H and the curved piece IK.

LMN is a guide for the eye, in order to direct it in the axis of the lenſes; it conſiſts of two braſs tubes, one ſliding within the other, and a vertical flat piece, at the top of which is the hole for the eye. The outer tube is ſeen at MN, the vertical piece is repreſented at LM. The inner tube may be pulled out, or puſhed in, to adjuſt it to the focus of the glaſſes. The vertical piece may be raiſed or depreſſed, that the hole, through which the object is to be viewed, may coincide with the centre of the field of view; it is fixed by a milled ſcrew at M, which could not be ſhown in this figure.

At N is a dove-tailed piece of braſs, made to receive the dove tail at the end of the tubes MN, by which it is affixed to the wooden box ABCDE. The tubes MN may be removed from this box occaſionally, for the convenience of packing it up in a leſs compaſs.

OP, a ſmall tube which carries the magnifiers.

O, one of the magnifiers; it is ſcrewed into the end of a tube, which ſlides within the tube P; the tube P may be unſcrewed occaſionally from the wooden body.

QRSTVX, a long ſquare bar, which paſſes through the ſockets YZ, and carries the ſtage or frame that holds the objects; this bar may be moved backward or forward, in order to adjuſt it to the focus by means of the pinion which is at *a*.

b, A handle furniſhed with an univerſal joint, for more conveniently turning the pinion. When the handle is removed, the nut (fig. 27.) may be uſed in its ſtead.

d e, A braſs bar, to ſupport the curved piece KI, and keep the body AB firm and ſteady.

f g h i, The ſtage for opaque objects: it fits upon the bar QRST by means of the ſocket *h i*, and is brought nearer to or removed farther from the magnifying lens by turning the pinion *a*: the objects are placed in the front ſide of the ſtage (which cannot be ſeen in this figure) between four ſmall braſs plates; the edges of two of theſe are ſeen at *k l*. The two upper pieces of braſs are moveable; they are fixed to a plate, which is acted on by a ſpiral ſpring, that preſſes them down, and confines the ſlider with the objects: this plate, and the two upper pieces of braſs are lifted up by the ſmall nut *m*.

At the lower part of the ſtage, there is a ſemicircular lump of glaſs *n*, which is deſigned to receive the light from the lamp, fig. 29. and to collect and throw it on the concave mirror *o*, whence it is to be reflected on the object.

The upper part *f g r s* (fig. 26.) of the opaque ſtage takes out, that the ſtage for tranſparent objects may be inſerted in its place.

Fig. 28. repreſents the ſtage for tranſparent objects; the two legs 5 and 6 fit into the top of the under part *r s h i* of the ſtage for opaque objects; 7 is the part which confines or holds the ſliders, and through which they are to be moved; 9 and 10 a braſs tube, which contains the lenſes for condenſing the light, and throwing it upon the object; there is a ſecond tube within that, marked 9 and 10, which may be placed at different diſtances from the object by the pin 11.

When this ſtage is uſed as a ſingle microſcope, without any reference to the lucernal, the magnifiers, or object lenſes, are to be ſcrewed into the hole 12, and to be adjuſted to a proper focus by the nut 13.

N. B. At the end AB (fig 26.) of the wooden body there is a ſlider, which is repreſented as partly drawn out at A: when quite taken out, three grooves will be perceived; one of which contains a board that forms the end of the box; the next contains a frame with a greyed glaſs; and the third, or that fartheſt from the end AB, two large convex lenſes.

Fig. 29. repreſents one of Argand's lamps, which are the moſt ſuitable for microſcopic purpoſes, on account of the clearneſs, the intenſity, and the ſteadineſs of the light. The following account of the method of managing them, with other obſervations, is copied from an account given by Mr Parker with thoſe he ſells.

The principle on which the lamp acts, conſiſts in diſpoſing the wick in thin parts, ſo that the air may come into contact with all the burning fuel; by which means, together with an increaſe of the current of air occaſioned by rarefaction in the glaſs tube, the whole of the fuel is converted into flame.

The wicks are circular; and, the more readily to regulate the quantity of light, are fixed on a braſs collar, with a wire handle, by means of which they are raiſed or depreſſed at pleaſure.

To fix the wick on, a wooden mandril is contrived, which is tapered at one end, and has a groove turned at the other.

The wick has a ſelvage at one end, which is to be put foremoſt on the mandril, and moved up to the groove; then putting the groove into the collar of the wick-holder, the wick is eaſily puſhed forward upon it.

The wick-holder and wick being put quite down in their place, the ſpare part of the wick ſhould, while dry, be ſet a-light, and ſuffered to burn to the edge of the tubes; this will leave it more even than by cutting, and, being black by burning, will be much eaſier lighted: for this reaſon, the black ſhould never be quite cut off.

The lamp ſhould be filled an hour or two before it is wanted, that the cotton may imbibe the oil and draw the better.

The lamps which have a reſervoir and valve, need no other direction for filling than to do it with a proper trimming pot, carefully obſerving when they are full; then pulling up the valve by the point, the reſervoir, being turned with the other hand, may be replaced without ſpilling a drop.

Thoſe lamps which fill in the front like a bird-fountain, muſt be reclined on the back to fill; and this ſhould be done gently, that the oil in the burner may return into the body when ſo placed and filled: if, by being too full, any oil appears above the guard, only move the lamp a little, and the oil will diſappear; the lamp may then be placed erect, and the oil will flow to its proper level.

The oil muſt be of the ſpermaceti kind, commonly called chamber-oil, which may generally be diſtinguiſhed by its paleneſs, tranſparency, and inoffenſive ſcent: all thoſe oils which are of a red and brown colour, and of an offenſive ſcent, ſhould be carefully avoided as their glutinous parts clog the lamp, and the impurities in ſuch oil, not being inflammable, will accumulate and remain in the form of a cruſt on the wick. Seal oil is nearly as pale and ſweet as chamber oil; but being of a heavy ſluggiſh quality, is not proper for lamps with fine wicks

Whenever bad oil has been uſed, on changing it, the wick muſt alſo be changed; becauſe, after having imbibed the coarſe particles in its capillary tubes it, will not draw up the fine oil.

To obtain the greateſt degree of light, the wick ſhould be trimmed exactly even, the flame will then be completely equal.

There will be a great advantage in keeping the lamp clean, eſpecially the burner and air-tubes; the neglect of cleanlineſs in lamps is too common: a candleſtick is generlly cleaned every time it is uſed, ſo ſhould a lamp; and if a candleſtick is not to be objected to becauſe it does not give light after the candle is exhauſted, ſo a lamp ſhould not be thought ill of, if it does not give light when it wants oil or cotton; but this laſt has often happened, becauſe the deficiency is leſs viſible.

The glaſs tubes are beſt cleaned with a piece of waſh leather.

If a fountain-lamp is left partly filled with oil, it may be liable to overflow; this happens by the contraction of the air when cold, and its expanſion by the warmth of a room, the rays of the ſun, or the heat of the lamp when re-lighted: this accident may be effectually prevented by keeping the reſervoir filled, the oil not being ſubject to expanſion like air. On this account, thoſe with a common reſervoir are beſt adapted for microſcopic purpoſes.

To examine Opaque Objects with the Lucernal Microſcope. To render the uſe of this inſtrument eaſy, it is uſually packed with as many of the parts together as poſſible: it occupies on this account rather more room, but is much leſs embarraſſing to the obſerver, who has only three parts to put on after it is taken out of its box, namely, the guide for the eye, the ſtage, and the tube with its magnifier.

But to be more particular: Take out the wooden ſlider A (fig. 26.), then lift out the cover and the grey glaſs from their reſpective grooves under the ſlider A.

Put the end N of the guide for the eye LMM into its place, ſo that it may ſtand in the poſition which is repreſented in this figure.

Place the ſocket which is at the bottom of the opaque ſtage, on the bar QXT, ſo that the concave mirror *o* may be next the end DE of the wooden body.

Screw the tubes PO into the end DE. The magnifier you intend to uſe is to be ſcrewed on the end O of theſe tubes.

The handle G*b*, or the milled nut fig. 27. muſt be placed on the ſquare end of the pinion *a*.

Place the lamp lighted before the glaſs lump *n*, and the object you intend to examine between the ſpring-plates of the ſtage; and the inſtrument is ready for uſe.

In all microſcopes are there two circumſtances which muſt be particularly attended to: firſt, the modification of the light, or the proper quantity to illuminate the object; ſecondly, the adjuſtment of the inſtrument to the focus of the glaſſes and eye of the obſerver. In the uſe of the lucernal microſcope there is a third circumſtance, which is, the regulation of the guide for the eye.

1. To throw the light upon the object. The flame of the lamp is to be placed rather below the centre of the glaſs lump *n*, and as near it as poſſible; the concave mirror *o* muſt be ſo inclined and turned as to receive the light from the glaſs lump, and reflect it thence upon the object; the beſt ſituation of the concave mirror and the flame of the lamp depends on a combination of circumſtances, which a little practice will diſcover.

2. To regulate the guide for the eye, or to place the centre of the eye-piece L ſo that it may coincide with the focal point of the lenſes and the axis of viſion: Lengthen and ſhorten the tubes MN, by drawing out or puſhing in the inner tube, and raiſing or depreſſing the eye-piece ML, till you find the large lens (which is placed at the end AB of the wooden body) filled by an uniform field of light, without any priſmatic colours round the edge; for till this piece is properly fixed, the circle of light will be very ſmall, and only occupy a part of the lens: the eye muſt be kept at the centre of the eye piece L, during the whole of the operation; which may be rendered ſomewhat eaſier to the obſerver, on the firſt uſe of the inſtrument, if he hold a piece of white paper parallel to the large lens, removing it from or bringing it nearer to them till he find the place where a lucid circle, which he will perceive on the paper, is brighteſt and moſt diſtinct; then he is to fix the centre of the eye-piece to coincide with that ſpot; after which a very ſmall adjuſtment will ſet it perfectly right.

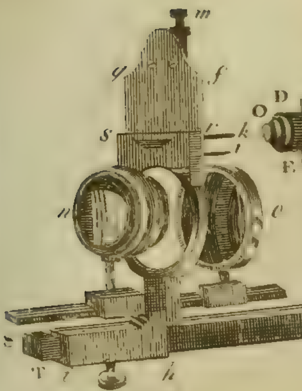
3. To adjuſt the lenſes to their focal diſtance. This is effected by turning the pinion *a*, the eye being at the ſame time at the eye-piece L. The grey glaſs is often placed before the large lenſes, while regulating the guide for the eye, and adjuſting for the focal diſtance.

If the obſerver, in the proceſs of his examination of an object, advance rapidly from a ſhallow to a deep magnifier, he will ſave himſelf ſome labour by pulling out the internal tube at O.

The upper part *f g r s* of the ſtage is to be raiſed or lowered occaſionally, in order to make the centre of the object coincide with the centre of the lens at O.

To delineate objects, the grey glaſs muſt be placed before the large lenſes; the picture of the object will be formed on this glaſs, and the outline may be accurately taken by going over the picture with a pencil.

Fig. 26.



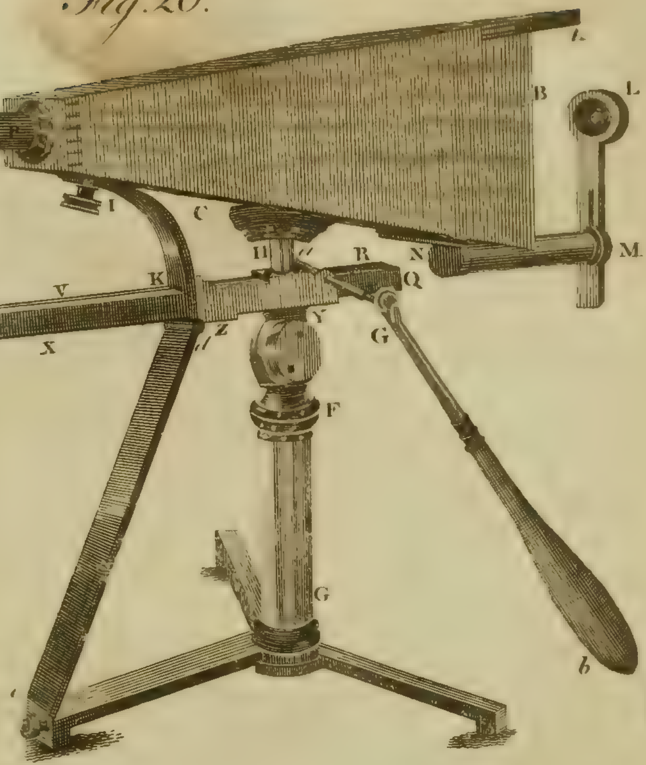


Fig. 27.

Fig. 28.

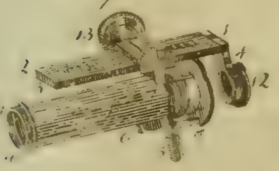


Fig. 29.

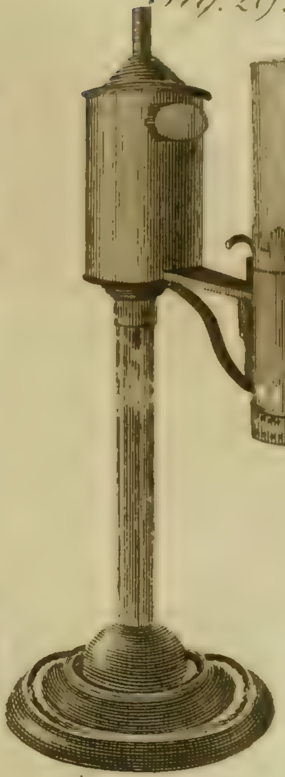


Fig. 30.

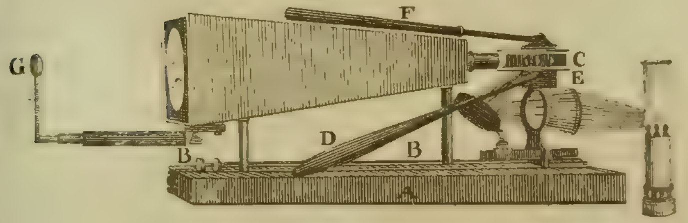
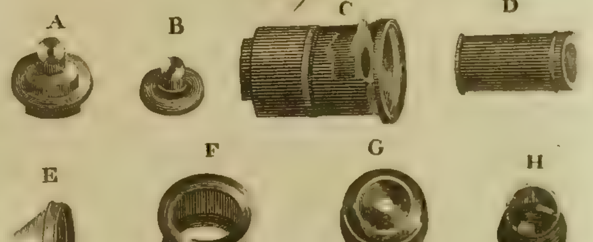
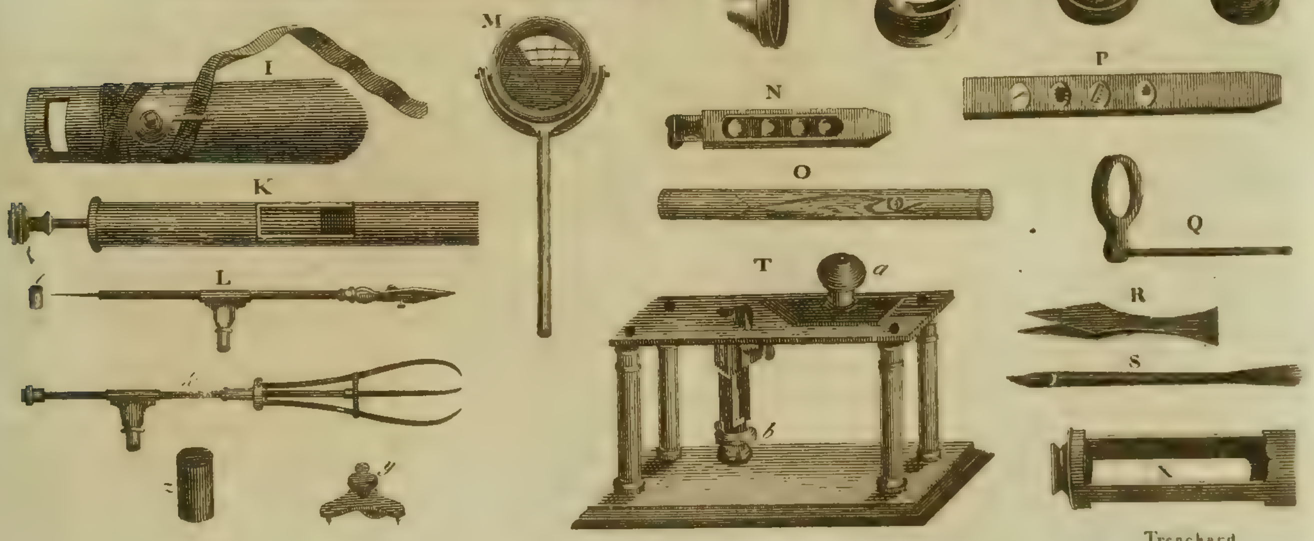


Fig. 31.





Trenchard

The opaque part may be uſed in the day-time without a lamp, provided the large lenſes at A B are ſcreened from the light.

To uſe the Lucernal Microſcope in the examination of Tranſparent Objects. The inſtrument is to remain as before: the upper part *f g s* of the opaque ſtage muſt be removed, and the ſtage for tranſparent objects, repreſented at fig. 28. put in its place; the end 9 10 to be next the lamp.

Place the greyed glaſs in its groove at the end A B, and the objects in the ſlider-holder at the front of the ſtage; then tranſmit as ſtrong a light as you are able on the object, which you will eaſily do by raiſing or lowering the lamp.

The object will be beautifully depicted on the grey glaſs: it muſt be regulated to the focus of the magnifier, by turning the pinion *a*.

The object may be viewed either with or without the guide for the eye. A ſingle obſerver will ſee an object to the greateſt advantage by uſing this guide, which is to be adjuſted as we have deſcribed above. If two or three wiſh to examine the object at the ſame time, the guide for the eye muſt be laid aſide.

Take the large lens out of the groove, and receive the image on the grey glaſs; in this caſe, the guide for the eye is of no uſe: if the grey glaſs be taken away, the image of the object may be received on a paper ſcreen.

Take out the grey glaſs, replace the large lenſes, and uſe the guide for the eye; attend to the foregoing directions, and adjuſt the object to its proper focus. You will then ſee the object in a blaze of light almoſt too great for the eye, a circumſtance that will be found very uſeful in the examination of particular objects. The edges of the object in this mode will be ſomewhat coloured: but as it is only uſed in this full light for occaſional purpoſes, it has been thought better to leave this ſmall imperfection, than, by remedying it, to ſacrifice greater advantages; the more ſo, as this fault is eaſily corrected, and a new and intereſting view of the object is obtained, by turning the inſtrument out of the direct rays of light, and permitting them to paſs through only in an oblique direction, by which the upper ſurface is in ſome degree illuminated, and the object is ſeen partly as opaque, partly as tranſparent. It has been already obſerved, that the tranſparent objects might be placed between the ſlider-holders of the ſtage for opaque objects, and then be examined as if opaque.

Some tranſparent objects appear to the greateſt advantage when the lens at 9 10 is taken away; as, by giving too great a quantity of light, it renders the edges leſs ſharp.

The variety of views which may be taken of every object by means of the improved lucernal microſcope, will be found to be of great uſe to an accurate obſerver: it will give him an opportunity of correcting or confirming his diſcoveries, and inveſtigating thoſe parts in one mode which are inviſible in another.

To throw the image of tranſparent objects on a ſcreen, as in the ſolar microſcope. It has been long a microſcopical deſideratum, to have an inſtrument by which the image of tranſparent objects might be thrown on a ſcreen, as in the common ſolar microſcope: and this not only becauſe the ſun is ſo uncertain in this climate, and the uſe of the ſolar microſcope requires confinement in the fineſt part of the day, when time ſeldom hangs heavy on the mind; but as it alſo affords an increaſe of pleaſure, by diſplaying its wonders to ſeveral perſons at the ſame inſtant, without the leaſt fatigue to the eye.

This purpoſe is now effectually anſwered, by affixing the tranſparent ſtage of the lucernal to a lanthorn, with one of Argand's lamps.--The lamp is placed within the lanthorn, and the end 9 10 of the tranſparent ſtage is ſcrewed into a female ſcrew, which is rivetted in the ſliding part of the front of the lanthorn; the magnifying lenſes are to be ſcrewed into the hole repreſented at 12, and they are adjuſted by turning the milled nut. The quantity of light is to be regulated by raiſing and lowering the ſliding-plate or the lamp.

Apparatus which uſually accompanies the improved Lucernal Microſcope. The ſtage for opaque objects, with its ſemicircular lump of glaſs, and concave mirror. The ſtage for tranſparent objects, which fits on the upper part of the foregoing ſtage. The ſliding tube, to which the magnifiers are to be affixed: one end of theſe is to be ſcrewed on the end D of the wooden body; the magnifier in uſe is to be ſcrewed to the other end of the inner tube. Eight manifying lenſes: theſe are ſo conſtructed, that they may be combined together, and thus produce a very great variety of magnifying powers. A fiſh-pan, ſuch as is repreſented at I. A ſteel wire L, with a pair of nippers at one end, and a ſmall cylinder of ivory *l* at the other. A ſlider of braſs N, containing a flat glaſs ſlider, and a braſs ſlider into which are fitted ſome ſmall concave glaſſes. A pair of forceps. Six large and ſix ſmall ivory ſliders, with tranſparent objects. Fourteen wooden ſliders, with four opaque objects in each ſlider; and two ſpare ſliders. Some capillary tubes for viewing ſmall animalcula.

Ingenious men ſeldom content themſelves with an inſtrument under one form; hence ſuch a variety of microſcopes, hence many alterations in the Lucernal Microſcope. Mr Adams himſelf, we underſtand, has fitted up this laſt in a great many different ways; and it is reaſonable to think that no perſon is more likely to give it every improvement of which it is ſuſceptible. Of the alterations by other hands we ſhall only particulariſe one, made by Mr Jones of Holborn (B), whoſe deſcription is as follows:

A, repreſents a portion of the top of the mahogany

box

(B) We truſt the reader will never conſider any paragraph wherein the name of an inſtrument-maker or other artiſt is inſerted, as a recommendation of thoſe artiſts by the editors of this work. In the courſe of a pretty extenſive correſpondence, they have been favoured with very liberal communications from various artiſts, for which they are greatly indebted to them: the inſerting their names in this work is therefore to be conſidered as a grateful acknowledgment from the editors for favours conferred on them,—not as a teſtimo-

nial

box in which it packs, to preſerve it ſteady; it ſlides in a dove tail groove withinſide, a ſimilar groove to which is cut in the top of the box A; ſo that when the inſtrument is to be uſed, it is ſlipt out of the box withinſide, and then ſlipt into the groove at top ready for uſe, almoſt inſtantly, as ſhown in the figure. The adjuſtment of the objects is at the ſtage E; for the right focal diſtance is readily and conveniently made by turning the long ſcrew-rod B B, which goes thro' the two pillars ſupporting the box, and works in the baſe of the braſs ſtage E; which baſe is alſo dovetailed, ſo as to have a regular and ſteady motion in another braſs baſis that ſupports it. In this inſtrument, therefore, the pyramidical box does not move; but the ſtage part only, which, from its ſmall weight, moves in the moſt agreeable and ſteady manner. While obſerving the image of the object upon the glaſs through the ſight-hole at G, the object may be moved or changed by only turning the rack-work and pinion applied to the ſtage, by means of the handle D, for that purpoſe. By this contrivance you have no occaſion to change your poſition during the view of the objects upon one of the ſliders. This motion changes the objects horizontally only; and as they are generally placed exactly in one line, it anſwers all the purpoſes for which this motion is intended very well. But it may ſometimes happen that the obſerver would wiſh to alter the vertical poſition of the object; to perform which there is another plane rod at F, that acts ſimply as a lever for this purpoſe, and moves the ſliding part of the ſtage E vertically either upwards or downwards.

Thus, without altering his poſition, the obſerver may inveſtigate all parts of the objects in the moſt ſatisfactory manner. Rack-work and pinion might be applied to the ſtage for the vertical motion alſo; but as it would materially enhance the expence, it is ſeldom applied. The braſs work at the handle of D contains a Hooke's univerſal joint.

The brilliancy of the images of the objects ſhown upon the large lenſes at the end of the box, being very frequently ſo great as to dazzle the eyes, Mr Jones applies a ſlight tinge of blue, green, and other coloured glaſs, to the ſight-hole at G, which ſoftens this glare, and caſts an agreeable hue upon the objects.

Deſcription of thoſe Parts of a Miſcroſcopical Apparatus, common to moſt Inſtruments, which are delineated at fig. 31.

A and B repreſent the braſs cells which contain the magnifiers belonging to the different kinds of compound microſcopes. The magnifiers are ſometimes contained in a ſlider like that which is delineated at S (fig. 24). The lenſes of A and B are confined by a ſmall cap; on unſcrewing this, the ſmall lens may be taken out and cleaned. The magnifiers A of the lucernal microſcope are ſo contrived, that any two of them may be ſcrewed together, by which means a conſiderable variety of magnifying power is obtained.

To get at the lenſes in the ſlider S (fig. 24.), take out the two ſcrews which hold on the cover.

C, repreſents the general form of the ſlider-holder. It conſiſts of a cylindrical tube, in which an inner tube is forced up by a ſpring. It is uſed to receive the ivory or any other ſlider, in which the tranſparent objects are placed; theſe are to be ſlid between the two upper plates: the hollow part in one of the plates is deſigned for the glaſs tubes.

D, the condenſing lens and its tube, which fits into the ſlider-holder C, and may be moved up and down in it. When this piece is puſhed up as far as it will go, it condenſes the light of a candle, which is reflected on it by the plain mirror of the compound microſcope, and ſpreads it uniformly over the object; in this caſe it is beſt adapted to the ſhalloweſt magnifiers. If the deeper lenſes are uſed, it ſhould be drawn down, or rather removed further from the object, that it may concentrate the light in a ſmall compaſs, and thus render it more denſe. The condenſing lens is ſometimes fitted up differently; but the principle being the ſame, it will be eaſy to apply it to uſe notwithſtanding ſome variations in the mechaniſm.

E, a braſs cone. It fixes under the ſlider-holder, and is uſed to leſſen occaſionally the quantity of light which comes from the mirror to any object.

F, a box with two flat glaſſes, which may be placed at different diſtances from each other in order to confine a ſmall living inſect.

G, a ſmall braſs box to hold the ſilver ſpeculum H.

H, a ſmall ſilver concave ſpeculum, deſigned to reflect the light from the mirror on opaque objects; it ſhould only be uſed with the ſhallow magnifiers. It is applied in different ways to the compound microſcope; ſometimes to a tube ſimilar to that repreſented at X, which ſlides on the lower part of the body; ſometimes it is ſcrewed into the ring of the piece Q; the pin of this generally fits into one of the holes in the ſtage. When this ſpeculum is uſed, the ſlider-holder ſhould be removed.

I, a fiſh-pan, whereon a ſmall fiſh may be faſtened, in order to view the circulation of the blood: its tail is to be ſpread acroſs the oblong hole at the ſmalleſt end, and tied faſt by means of the ribbon fixed thereto, by ſhoving the knob which is on the back of it through the ſlit made in the ſtage; the tail of the fiſh may be brought under the lens which is in uſe.

K, a cylindrical piece, intended for the ſolar opaque microſcope: by pulling back the ſpiral ſpring, ſmaller or larger objects may be confined in it.

k, A pair of triangular nippers for taking hold of and confining a large object.

L, a long ſteel wire, with a ſmall pair of pliers at one end and a ſteel point at the other: the wire ſlips backwards or forwards in a ſpring tube, which is affixed to a joint, at the bottom of which is a pin to fit one of the holes in the ſtage; this piece is uſed to confine ſmall objects.

l, A ſmall ivory cylinder that fits on the pointed end of the ſteel wire L; it is deſigned to receive opaque objects. Light-coloured ones are to be ſtuck on the dark ſide, and *vice verſa*.

M, a convex lens, which fits to the ſtage by means of

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nial of their opinion of the abilities of an individual, or as deſigned to inſinuate any preference over others in the ſame line, where ſuch preference has not been already beſtowed by the public.

of the long pin adhering to it. This piece is deſigned to collect the light from the ſun or a candle, and to throw them on any object placed on the ſtage; but it is very little uſed at preſent.

N, a braſs ſlider, into which is fitted a flat piece of glaſs, and a braſs ſlider containing four ſmall glaſſes, one or two of them concave, the others flat; it is deſigned to confine ſmall living objects, and when uſed is to be placed between the two upper plates of the ſliderholder.

O, a glaſs tube to receive a ſmall fiſh, &c.

P, repreſents one of the ivory ſliders, wherein objects are placed between two pieces of talc, and confined by a braſs ring.

Q, a piece to hold the ſpeculum H: this piece is generally fitted to the microſcope repreſented at fig. 12.

R, a pair of forceps, to take up any occaſional object.

S, a camel's hair pencil to bruſh the duſt off the glaſſes; the upper part of the quill is ſcooped out, to take up a drop of any fluid, and place it on either of the glaſſes for examination.

T, an inſtrument for cutting thin tranſverſe ſections of wood. It conſiſts of a wooden baſe, which ſupports four braſs pillars; on the top of the pillars is placed a flat piece of braſs, near the middle of which there is a triangular hole.

A ſharp knife, which moves in a diagonal direction, is fixed on the upper ſide of the aforementioned plate, and in ſuch a manner that the edge always coincides with the ſurface thereof.

The knife is moved backwards and forwards by means of the handle *a*. The piece of wood is placed in the triangular trough which is under the braſs plate, and is to be kept ſteady therein by a milled ſcrew which is fitted to the trough; the wood is to be preſſed forward for cutting by the micrometer ſcrew *b*.

The pieces of wood ſhould be applied to this inſtrument immediately on being taken out of the ground, or elſe they ſhould be ſoaked for ſome time in water, to ſoften them ſo that they may not hurt the edge of the knife.

When the edge of the knife is brought in contact with the piece of wood, a ſmall quantity of ſpirits of wine ſhould be poured on the ſurface of the wood, to prevent its curling up; it will alſo make it adhere to the knife, from which it may be removed by preſſing a piece of blotting paper on it.

y, An appendage to the cutting engine, which is to be uſed inſtead of the micrometer ſcrew, being preferred to it by ſome. It is placed over the triangular hole, and kept flat down upon the ſurface of the braſs plate, while the piece of wood is preſſed againſt a circular piece of braſs which is on the under ſide of it. This circular piece of braſs is fixed to a ſcrew, by which its diſtance from the flat plate on which the knife moves may be regulated.

z, An ivory box, containing at one end ſpare talc for the ivory ſliders, and at the other ſpare rings for preſſing the talcs together and confining them to the ſlider.

After what has been related of Microſcopes, they cannot be ſaid to complete without the valuable addition of a *micrometer*; for the uſe and advantages of which, ſee the article Micrometer.

Having preſented our readers with deſcriptions of the various microſcopes generally uſed, we think it our duty to point out to them thoſe which we conceive to be beſt calculated to anſwer the purpoſes of ſcience. The firſt which preſents itſelf to our mind is that of *Ellis*: It is better adapted, than any other portable microſcope, to the purpoſe of general obſervation; ſimple in its conſtruction, and general in its application. To thoſe who prefer a double microſcope, we ſhould recommend that figured in Plate CCXCVIII. (12.) If opaque objects, as inſects, &c. be ſubjects of inveſtigation, the *Lucernal Microſcope* claims the preference: but if amuſement alone guides the choice, the *Solar Microſcope* muſt be fixed upon.

We ſhall now proceed to explain ſome neceſſary particulars reſpecting the method of uſing microſcopes: after which, we ſhall ſubjoin an enumeration of the principal objects diſcovered or elucidated by their means. On this ſubject Mr Adams, in his *Eſſay on the Microſcope*, has been very copious; with a view, as he informs us, to remove the common complaint made by Mr Baker, "that many of thoſe who purchaſe microſcopes are ſo little acquainted with their general and extenſive uſefulneſs, and ſo much at a loſs for objects to examine by them, that after diverting their friends ſome few times with what they find in the ſliders which generally accompany the inſtrument, or perhaps with two or three common objects, the microſcope is laid aſide as of little further value; whereas no inſtrument has yet appeared in the world capable of affording ſo conſtant, various, and ſatisfactory an entertainment to the mind."

I. In uſing the microſcope, there are three things neceſſary to be conſidered. (1.) The preparation and adjuſtment of the inſtrument itſelf. (2.) The proper quantity of light, and the beſt method of adapting it to the object. (3.) The method of preparing the objects, ſo that their texture may be properly underſtood.

1. With regard to the microſcope itſelf, the firſt thing neceſſary to be examined is, whether the glaſſes be clean or not: if they are not ſo, they muſt be wiped with a piece of ſoft leather, taking care not to ſoil them afterwards with the fingers; and, in replacing them, care muſt be taken not to place them in an oblique ſituation. We muſt likewiſe be careful not to let the breath fall upon the glaſſes, nor to hold that part of the body of the inſtrument where the glaſſes are placed with a warm hand; becauſe thus the moiſture expelled by the heat from the metal will condenſe upon the glaſs, and prevent the object from being diſtinctly ſeen. The object ſhould be brought as near the centre of the field of view as poſſible; for there only it will be exhibited in the greateſt perfection. The eye ſhould be moved up and down from the eye-glaſs of a compound microſcope, till the ſituation is found where the largeſt field and moſt diſtinct view of the object are to be had: but every perſon ought to adjuſt the microſcope to his own eye, and not to depend upon the ſituation it was placed in by another. A ſmall magnifying power ſhould

always be begun with; by which means the obſerver will beſt obtain an exact idea of the ſituation and connection of the whole; and will of conſequence be leſs liable to form any erroneous opinion when the parts are viewed ſeparately by a lens of greater power. Objects ſhould alſo be examined firſt in their moſt natural poſition: for if this be not attended to, we ſhall be apt to form very inadequate ideas of the ſtructure of the whole, as well as of the connection and uſe of the parts. A living animal ought to be as little hurt or diſcompoſed as poſſible.

From viewing an object properly, we may acquire a knowledge of its nature: but this cannot be done without an extenſive knowledge of the ſubject, much patience, and many experiments; as in a great number of caſes the images will reſemble each other, though derived from very different ſubſtances. Mr Baker therefore adviſes us not to form an opinion too ſuddenly after viewing a microſcopical object; nor to draw our inferences till after repeated experiments and examinations of the object in many different lights and poſitions; to paſs no judgment upon things extended by force, or contracted by dryneſs, or in any manner out of a natural ſtate, without making ſuitable allowances. The true colour of objects cannot be properly determined by very great magnifiers; for as the pores and interſtices of an object are enlarged according to the magnifying power of the glaſſes made uſe of, the component particles of its ſubſtance will appear ſeparated many thouſand times farther aſunder than they do to the naked eye: hence the reflection of the light from theſe particles will be very different, and exhibit different colours. It is likewiſe ſomewhat difficult to obſerve opaque objects; and as the apertures of the larger magnifiers are but ſmall, they are not proper for the purpoſe. If an object be ſo very opaque, that no light will paſs through it, as much as poſſible muſt be thrown upon the upper ſurface of it. Some conſideration is likewiſe neceſſary in forming a judgment of the motion of living creatures, or even of fluids, when ſeen through the microſcope; for as the moving body, and the ſpace wherein it moves, are magnified, the motion will alſo be increaſed.

2. On the management of the light depends in a great meaſure the diſtinctneſs of the viſion: and as, in order to have this in the greateſt perfection, we muſt adapt the quantity of light to the nature of the object and the focus of the magnifier, it is therefore neceſſary to view it in various degrees of light. In ſome objects, it is difficult to diſtinguiſh between a prominence and a depreſſion, a ſhadow or a black ſtain; or between a reflection of light and whiteneſs, which is particularly obſervable in the eye of the libella and other flies: all of theſe appearing very different in one poſition from what they do in another. The brightneſs of an object likewiſe depends on the quantity of light, the diſtinctneſs of viſion, and on regulating the quantity to the object; for ſome will be in a manner loſt in a quantity of light ſcarce ſufficient to render another viſible.

There are various ways in which a ſtrong light may be thrown upon objects; as by means of the ſun and a convex lens. For this purpoſe, the microſcope is to be placed about three feet from a ſouthern window; then take a deep convex lens, mounted on a ſemicircle and ſtand, ſo that its poſition may eaſily be varied; place this lens between the object and the window, ſo that it may collect a conſiderable number of ſolar rays, and refract them on the object or the mirror of the microſcope. If the light thus collected from the ſun be too powerful, it may be leſſened by placing a piece of oiled paper, or a piece of glaſs lightly greyed, between the object and lens. Thus a proper degree of light may be obtained, and diffuſed equally all over the ſurface of an object: a circumſtance which ought to be particularly attended to; for if the light be thrown irregularly upon it, no diſtinct view can be obtained. If we mean to make uſe of the ſolar light, it will be found convenient to darken the room, and to reflect the rays of the ſun on the abovementioned lens by means of the mirror of a ſolar microſcope fixed to the window-ſhutter; for thus the obſerver will be enabled to preſerve the light on his object, notwithſtanding the motion of the ſun. But by reaſon of this motion, and the variable ſtate of the atmoſphere, ſolar obſervations are rendered both tedious and inconvenient: whence it will be proper for the obſerver to be furniſhed with a large tin lanthorn, formed ſomething like the common magic lanthorn, capable of containing one of Argand's lamps. This, however, ought not to be of the fountain kind, leſt the rarefaction of the air in the lanthorn ſhould force the oil over. There ought to be an aperture in the front of the lanthorn, which may be moved up and down, and be capable of holding a lens; by which means a pleaſant and uniform as well as ſtrong light may eaſily be procured. The lamp ſhould likewiſe move on a rod, ſo that it may be eaſily raiſed or depreſſed. This lanthorn may likewiſe be uſed for many other purpoſes; as viewing of pictures, exhibiting microſcopic objects on a ſcreen, &c. A weak light, however, is beſt for viewing many tranſparent objects: among which we may reckon the prepared eyes of flies, as well as the animalcules in fluids. The quantity of light from a lamp or candle may be leſſened by removing the microſcope to a greater diſtance from them, or by diminiſhing the ſtrength of the light which falls upon the objects. This may very conveniently be done by pieces of black paper with circular apertures of different ſizes, and placing a larger or ſmaller one upon the reflecting mirror, as occaſion may require. There is an oblique ſituation of the mirrors, which makes likewiſe an oblique reflection of the light eaſily diſcovered by practice, (but for which no general rule can be given in theory); and which will exhibit an object more diſtinctly than any other poſition, ſhowing the ſurface, as well as thoſe parts through which the light is tranſmitted. The light of a lamp or candle is generally better for viewing microſcopic objects than day-light; it being more eaſy to modify the former than the latter, and to throw it upon the objects with different degrees of denſity.

3. With regard to the preparation of objects, Swammerdam has, in that particular, excelled almoſt all other inveſtigators who either preceded or have ſucceeded him. He was ſo aſſiduous and indefatigable, that neither difficulty nor diſappointment could make the leaſt impreſſion upon him; and he never abandoned the purſuit of any object until he had ob-

tained a ſatisfactory idea of it. Unhappily, however, the methods he made uſe of in preparing his objects for the microſcope are now entirely unknown. Dr Boerhaave examined with the ſtricteſt attention all the letters and manuſcripts of Swammerdam which he could find; but his reſearches were far from being ſuccefsful. The following particulars, however, have thus come to the knowledge of the public.

For diſſecting of *ſmall inſects*, Swammerdam had a braſs table made by S. Muſchenbroek, to which were affixed two braſs arms moveable at pleaſure to any part of it. The upper part of theſe vertical arms was conſtructed in ſuch a manner as to have a ſlow vertical motion; by which means the operator could readily alter their height as he ſaw convenient. One of theſe arms was to hold the minute objects, and the other to apply the microſcope.

The lenſes of Swammerdam's microſcopes were of various ſizes as well as foci: but all of them the beſt that could be procured, both for the tranſparency of the glaſs and the fineneſs of the workmanſhip. His obſervations were always begun with the ſmalleſt magnifiers, from which he proceeded to the greateſt; but in the uſe of them, he was ſo exceedingly dextrous, that he made every obſervation ſubſervient to that which ſucceeded it, and all of them to the confirmation of each other, and to the completing of the deſcription. His chief art ſeems to have been in conſtructing ſciſſars of an exquiſite fineneſs, and making them very ſharp. Thus he was enabled to cut very minute objects to much more advantage than could be done by knives and lancets; for theſe, though ever ſo ſharp and fine, are apt to diſorder delicate ſubſtances by diſplacing ſome of the filaments, and drawing them after them as they paſs through the bodies; but the ſciſſars cut them all equally. The knives, lancets, and ſtyles he made uſe of in his diſſections, were ſo fine that he could not ſee to ſharpen them without the aſſiſtance of a magnifying glaſs; but with theſe he could diſſect the inteſtines of bees with the ſame accuracy that the beſt anatomiſts can do thoſe of large animals. He made uſe alſo of very ſmall glaſs tubes no thicker than a briſtle, and drawn to a very fine point at one end, but thicker at the other. Theſe were for the purpoſe of blowing up, and thus rendering viſible the ſmalleſt veſſels which could be diſcovered by the microſcope; to trace their courſes and communications, or ſometimes to inject them with coloured liquors.

Swammerdam ſometimes made uſe of ſpirit of wine, water, or oil of turpentine, for ſuffocating the inſects he wiſhed to examine; and would preſerve them for a time in theſe liquids. Thus he kept the parts from putrefying, and gave them beſides ſuch additional ſtrength and firmneſs, as rendered the diſſections much more eaſy than they would otherwiſe have been. Having then divided the body tranſverſely with the ſciſſars, and made what obſervations he could without farther diſſection, he proceeded to extract the inteſtines carefully with very fine inſtruments, to waſh away the fat in the like careful manner; and thus to put the parts into ſuch a ſtate as would beſt expoſe them to view; but theſe operations are beſt performed while the inſects are in their nympha ſtate.

Sometimes the delicate viſcera of the inſects, after having been ſuffocated as abovementioned, were put into water; after which, having ſhaken them gently, he procured an opportunity of examining them, eſpecially the air veſſels, which laſt he could thus ſeparate entire from all the other parts, to the admiration of all who beheld them; as theſe veſſels cannot be diſtinctly ſeen in any other manner, or indeed in any way whatever, without injuring them. Frequently alſo he injected water with a ſyringe to cleanſe the parts thoroughly, after which he blew them up with air and dried them; thus rendering them durable, and fit for examination at a proper opportunity. Sometimes he made very important diſcoveries, by examining inſects which he had preſerved for ſeveral years in balſam. Other inſects he punctured with a very fine needle; and after ſqueezing out all their moiſture through the holes made in this manner, he filled them with air, by means of very ſlender glaſs tubes; then dried them in the ſhade; and laſtly anointed them with oil of ſpike in which a little roſin had been diſſolved; and by which means they, for a long time, retained their proper forms. He was likewiſe in poſſeſſion of a ſingular ſecret, by which he could preſerve the limbs of inſects as limber and perſpicuous as ever they had been. He uſed to make a ſmall puncture or inciſion in the tails of worms; and after having with great caution ſqueezed out all the humours, as well as great part of the viſcera, he injected them with wax in ſuch a manner as to give them the appearance of living creatures in perfect health. He found that the fat of all inſects was entirely diſſolvable in oil of turpentine; by which means he was enabled plainly to diſcern the viſcera; though, after this diſſolution, it was neceſſary to cleanſe and waſh them frequently in clean water. In this manner he would frequently have ſpent whole days in the preparation of a ſingle caterpillar, and cleanſing it from its fat, in order to diſcover the true ſituation of the inſect's heart. He had a ſingular dexterity in ſtripping off the ſkins of caterpillars that were on the point of ſpinning their cones. This was done by letting them drop by their threads into ſcalding water, and then ſuddenly withdrawing them. Thus the epidermis peeled off very eaſily; and, when this was done, he put them into diſtilled vinegar and ſpirit of wine mixed together in equal proportions; which, by giving a due degree of firmneſs to the parts, gave him an opportunity of ſeparating them with very little trouble from the exuviæ, without any danger to the internal parts. Thus the nymph could be ſhown to be wrapped up in the caterpillar and the butterfly in the nymph; and there is little doubt that thoſe who look into the works of Swmammerdam, will be amply recompenſed, whether they conſider the unexampled labour or the piety of the author.

M. Lyonet, a late eminent naturaliſt, uſually drowned the inſects he deſigned to examine; by which means he was enabled to preſerve both the ſoftneſs and tranſparency of the parts. According to him, the inſect, if very ſmall, *viz.* one tenth of an inch, or little more, in length, ſhould be diſſected on a glaſs ſomewhat concave. If it ſhould be ſuſpected that the inſect will putrefy by keeping for a few days, ſpirit of wine diluted with water muſt be ſubſtituted inſtead of pure water. The inſect muſt be ſuffered to dry; after which it may be faſtened by a piece of ſoft wax, and again covered with water.—Larger objects ſhould be placed in a trough of thin wood; and for this purpoſe the bottom of a common chip box will anſwer very well; only ſurrounding the edge of it with ſoft wax, to keep in the water or other fluid employed in preſerving the inſect. The body is then to be opened; and if the parts are ſoft like thoſe of a caterpillar, they ſhould be turned back, and fixed to the trough by ſmall pins, which ought to be ſet by a ſmall pair of nippers. At the ſame time the ſkin being ſtretched by another pair of finer forceps, the inſect muſt be put into the water, and diſſected therein, occaſionally covering it with ſpirit of wine. Thus the ſubject will be preſerved in perfection, ſo that its parts may be gradually unfolded, no other change being perceived than that the ſoft elaſtic parts become ſtiff and opaque, while ſome others loſe their colour.

The following inſtruments were made uſe of by M. Lyonet in his diſſection of the *Chenille de Saul*. A pair of ſciſſars as ſmall as could be made, with long and fine arms: A pair of forceps, with their ends ſo nicely adjuſted, that they could eaſily lay hold of a ſpider's thread, or a grain of ſand: Two fine ſteel needles fixed in wooden handles, about two inches and three quarters in length; which were the moſt generally uſeful inſtruments he employed.

Dr Hooke, who likewiſe made many microſcopic obſervations, takes notice, that the common ant or piſmire is much more troubleſome to draw than other inſects, as it is extremely difficult to get the body in a quiet natural poſture. If its feet be fettered with wax or glue, while the animal remains alive, it ſo twiſts its body, that there is no poſſibility of gaining a proper view of it; and if it be killed before any obſervation is made, the ſhape is often ſpoiled before it can be examined. The bodies of many minute inſects, when their life is deſtroyed inſtantly ſhrivel up; and this is obſervable even in plants as well as inſects, the ſurface of theſe ſmall bodies being affected by the leaſt change of air; which is particularly the caſe with the ant. If this creature, however, be dropped into rectified ſpirit of wine, it will inſtantly be killed; and when it is taken out, the ſpirit of wine evaporates, leaving the animal dry, and in its natural poſture, or at leaſt in ſuch a ſtate that it may eaſily be placed in whatever poſture we pleaſe.

Parts of inſects. The *wings*, in many inſects, are ſo tranſparent, that they require no previous preparation; but ſome of thoſe that are folded up under *elytra* or caſes, require a conſiderable ſhare of dexterity to unfold them; for theſe wings are naturally endowed with ſuch a ſpring, that they immediately fold themſelves again, unleſs care be taken to prevent them. The wing of the earwig, when expanded, is of a tolerable ſize, yet is folded up under a caſe not one eighth part of its bulk; and the texture of this wing renders it difficult to be unfolded. This is done with the leaſt trouble immediately after the inſect is killed. Holding then the creature by the thorax, between the finger and thumb, with a blunt-pointed pin endeavour gently to open it, by ſpreading it over the fore-finger, and at the ſame time gradually ſliding the thumb over it. When the wing is ſufficiently expanded, ſeparate it from the inſect by a ſharp knife or a pair of ſciſſars. The wing ſhould be preſſed for ſome time between the thumb and finger before it be removed; it ſhould then be placed between two pieces of paper, and again preſſed for at leaſt an hour; after which time, as there will be no danger of its folding up any more, it may be put between the talcs, and applied to the microſcope. Similar care is requiſite in diſplaying the wings of the notonecta and other water-inſects, as well as moſt kinds of grylli.

The minute *ſcales* or *feathers*, which cover the wings of moths or butterflies, afford very beautiful objects for the microſcope. Thoſe from one part of the wing frequently differ in ſhape from ſuch as are taken from other parts; and near the thorax, ſhoulder, and on the fringes of the wings, we generally meet with hair inſtead of ſcales. The whole may be bruſhed off the wing, upon a piece of paper, by means of a camel's-hair pencil; after which the hairs can be ſeparated with the aſſiſtance of a common magnifying glaſs.

It is likewiſe a matter of conſiderable difficulty to diſſect properly the *proboſcis* of inſects, ſuch as the gnat, tabanus, &c. and the experiment muſt be repeated a great number of times before the ſtructure and ſituation of the parts can be thoroughly inveſtigated, as the obſerver will frequently diſcover in one what he could not in another. The *collector of the bee* which forms a very curious object, ought to be firſt carefully waſhed in ſpirit of turpentine; by which means it will be freed from the unctuous matter adhering to it: when dry, it is again to be waſhed with a camel's hair-pencil to diſengage and bring forward the ſmall hairs which form part of this microſcopic beauty. The beſt method of managing the *ſtings* of inſects, which are in danger of being broken by reaſon of their hardneſs, is to ſoak the caſe and the reſt of the apparatus for ſome time in ſpirit of wine or turpentine; then lay them on a piece of paper, and with a blunt knife draw out the ſting, holding the ſheath with the nail of the finger or any blunt inſtrument; but great care is neceſſary to preſerve the *feelers* which when cleaned add much to the beauty of the object. The *beard* of the lepas antifera is to be ſoaked in clean ſoft water frequently bruſhing it while wet with a camel's-hair pencil: after it is dried, the bruſhing muſt be repeated with a dry pencil to diſengage and ſeparate the hairs which are apt to adhere together.

To view to advantage the *fat*, *brains*, and other ſimilar ſubſtances, Dr Hooke adviſes to render the ſurface ſmooth, by preſſing it between two plates of thin glaſs, by which means the matter will be rendered much thinner and more tranſparent; without this precaution, it appears confuſed by reaſon of the parts lying too thick upon one another. For *muſcular fibres* take a piece of the fleſh, thin and dry; moiſten it with warm water, and after this is evaporated the veſſels will appear more plain and diſtinct; and by repeated macerations they appear ſtill more ſo. The *exuviæ* of inſects afford a pleaſing object, and require but little preparation. If bent or curled up, they will become ſo relaxed by being kept a few hours in a moiſt atmoſphere, that you may eaſily extend them to their, natural poſitions; or the ſteam of warm water will anſwer the purpoſe very well.

The *eyes* of inſects in general form very curious and beautiful objects. Thoſe of the libellula and other flies, as well as of the lobſter, &c. muſt firſt be cleaned from the blood, &c. after which they ſhould be ſoaked in water for ſome days: one or two ſkins are then to be ſeparated from the eye, which would be otherwiſe too opaque and confuſed; but ſome care is requiſite in this operation; for if the ſkin be rendered too thin, it is impoſſible to form a proper idea of the organization of the part. In ſome ſubſtances, however, the organization is ſuch, that by altering the texture of the part, we deſtroy the objects which we wiſh to obſerve. Of this ſort are the nerves, tendons, muſcular fibres, many of which are viewed to moſt advantage when floating in ſome tranſparent fluid. Thus very few of the muſcular fibres can be diſcovered when we attempt to view them in the open air, though great numbers may be ſeen if they be placed in water or oil. By viewing the thread of a ligament in this manner, we find it compoſed of a vaſt number of ſmooth round threads lying cloſe together. Elaſtic objects ſhould be pulled or ſtretched out while they are under the microſcope, that the texture and nature of thoſe parts, the figure of which is altered by being thus pulled out, may be more fully diſcovered.

Other objects. To examine *bones* by the microſcope, they ſhould firſt be viewed as opaque objects; but afterwards, by procuring thin ſlices of them, they may be viewed as tranſparent. The ſections ſhould be cut in all directions, and be well waſhed and cleaned; and in ſome caſes maceration will be uſeful, or the bones may be heated red hot in a clear fire, and then taken out; by which means the bony cells will appear more conſpicuous. The *pores of the ſkin* may be examined by cutting off a thin ſlice off the upper ſkin with a razor, and then a ſecond from the ſame place; applying the latter to the microſcope. The lizard, guana, &c. have two ſkins, one very tranſparent, the other thicker and more opaque; and, ſeparating theſe two, you obtain very beautiful objects.

To view the *ſcales of fiſh* to advantage, they ought to be ſoaked in water for a few days, and then carefully rubbed to clean them from the ſkin and dirt which may adhere to them. The ſcales of the eel are a great curioſity; and the more ſo, as this creature was not known to have any ſcales till they were diſcovered by the microſcope. The method of diſcovering them is this. Take a piece of the ſkin of an eel from off its ſide, and ſpread it while moiſt on a piece of glaſs, that it may dry very ſmooth: when thus dried, the ſurface will appear all over dimpled or pitted by the ſcales, which lie under a ſort of cuticle or thin ſkin; which may be raiſed with the ſharp point of a penknife, together with the ſcales, which will then eaſily ſlip out; and thus we may procure as many as we pleaſe.

The *leaves* of many *trees*, as well as of ſome plants, when diſſected, form a very agreeable object. In order to diſſect them, take a few of the moſt perfect leaves you can find, and place them in a pan with clean water. Let them remain there three weeks, or a month, without changing the water; then take them up; and if they feel very ſoft, and almoſt rotten, they are ſufficiently ſoaked. They muſt then be laid on a flat board, and holding them by the ſtalk, draw the edge of a knife over the upper ſide of the leaf, which will take off moſt of the ſkin. Then turn the leaf, and do the ſame with the under ſide; and when the ſkin is taken off on both ſides, waſh out the pulpy matter, and the fibres will be exhibited in a very beautiful manner. The leaf may be ſlit into two parts, by ſplitting the ſtalk; and the ſkins peeled from the fibres will alſo make a good object. This operation is beſt performed in the autumn: the fibres of the leaves are much ſtronger at that ſeaſon, and leſs liable to be broken.—The internal ſtructure of ſhells may be obſerved by grinding them down on a hone; and all ores and minerals ſhould be carefully waſhed and bruſhed with a ſmall bruſh to remove any ſordes that may adhere to them.

To view the *circulation of the blood*, we muſt obſerve living animals of the moſt tranſparent kind.—A ſmall eel is ſometimes uſed for this purpoſe; in which caſe it muſt be cleanſed from the ſlime naturally adhering to it; after which it may be put into a tube filled with water, where it can be viewed in a ſatisfactory manner. The tail of any other ſmall fiſh may be viewed in the ſame manner, or put upon a ſlip of flat glaſs, and thus laid before the microſcope. By filling the tube with water when an eel is made uſe of, we prevent in a great meaſure the ſlimineſs of the animal from ſoiling the glaſs.

The particles of the blood form a very curious object, and have been carefully viewed by different philoſophers; who, nevertheleſs, differ from one another very much in their accounts of them. The beſt method of viewing theſe is to take a ſmall drop of blood when warm, and ſpread it as thin as poſſible upon a flat piece of glaſs. By diluting it a little with warm water, ſome of the large globules will be ſeparated from the ſmaller, and many of them ſubdivided; or a ſmall drop of blood may be put into a capillary glaſs-tube, and then placed before the microſcope. Mr Baker adviſes warm milk as proper to be mixed with the blood; but Mr Hewſon, who is accounted the moſt accurate obſerver, diluted the blood with that fluid which undoubtedly is more natural to it, *viz.* its own ſerum: by this method he could preſerve the ſmall particles entire, and view them diſtinctly; and thus he found that they were not globular, as had been imagined by other anatomiſts, but flat. Having ſhaken a piece of the craſſamentum of the blood in ſerum till the latter became a little coloured, he ſpread it with a ſoft hair pencil on a piece of thin glaſs, which he placed under the microſcope, in ſuch a manner as not be quite horizontal, but rather higher at one end than the other. Thus the ſerum flows from the higher to the lower part; and, as it flows, ſome of the particles will be found to ſwim on their flat ſides, and will appear to have a dark ſpot in the middle; while others will turn over from one ſide to the other as they roll down the glaſs. Many cruel experiments have been tried in order to obſerve the circulation of the blood in living creatures, and an apparatus has been invented for viewing the circulation in the meſentery of a frog; but as this can anſwer no uſeful purpoſe, and will never be put in practice by perſons of humanity, we forbear to mention it.

II. Beſides the objects for the microſcope already mentioned, there are innumerable others, ſome hardly viſible, and others totally inviſible, to the naked eye; and which therefore, in a more particular ſenſe, are denominated.

Microſcopic animals. They are the animalcules or moving bodies in water, in which certain ſubſtances have been infuſed; and of which there are a great many different kinds. Theſe animalcula are ſometimes found in water which we would call *pure*, did not the microſcopes diſcover its minute inhabitants; but not equally in all kinds of water, or even in all parts of the ſame kind of it. The ſurfaces of infuſions are generally covered with a ſcum which is eaſily broken, but acquires thickneſs by ſtanding. In this ſcum the greated number of animalcules are uſually found. Sometimes it is neceſſary to dilute the infuſions; but this ought always to be done with water, not only diſtilled, but viewed through a microſcope, leſt it ſhould alſo have animalcules in it, and thus prove a ſource of deception. It is, however, moſt proper to obſerve thoſe minute objects after the water is a little evaporated; the attention being leſs diverted by a few objects than when they appear in great numbers. One or two of the animalcules may be ſeparated from the reſt by placing a ſmall drop of water on the glaſs near that of the infuſion; join them together by making a ſmall connection between them with a pin; and as ſoon as you perceive that an animalcule has entered the clear drop, cut off the connection again.

Eels in paſte are obtained by boiling a little flour and water into the conſiſtence of book-binders paſte; then expoſing it to the air in an open veſſel, and beating it frequently together to keep the ſurface from growing mouldy or hard. In a few days it will be found peopled with myriads of little animals viſible to the naked eye, which are the eels in queſtion. They may be preſerved for a whole year by keeping the paſte moiſtened with water; and while this is done, the motion of the animals will keep the ſurface from growing mouldy. Mr Baker directs a drop or two of vinegar to be put into the paſte now and then. When they are applied to the microſcope, the paſte muſt be diluted in a piece of water for them to ſwim in.

Numberleſs animalcules are obſerved by the microſcope in infuſions of pepper. To make an infuſion for this purpoſe, bruiſe as much common black pepper as will cover the bottom of an open jar, and lay it thereon about half an inch thick: pour as much ſoft water into the veſſel as will riſe about an inch above the pepper. Shake the whole well together: after which they muſt not be ſtirred, but be left expoſed to the air for a few days; in which time a thin pellicle will be formed on the ſurface, in which innumerable animals are to be obſerved by the microſcope.

The microſcopic animals are ſo different from thoſe of the larger kinds, that ſcarce any ſort of analogy ſeems to exiſt between them; and one would almoſt be tempted to think that they lived in conſequence of laws directly oppoſite to thoſe which preſerve ourſelves and other viſible animals in exiſtence. They have been ſyſtematically arranged by O. F. Muller; though it is by no means probable that all the different claſſes have yet been diſcovered. Such as have been obſerved, however, are by this author divided in the following manner.

I. *Such as have no external organs.*

1. Monas: Punctiforma. A mere point.
2. Proteus: Mutabilis. Mutable.
3. Volvox: Sphæricum. Spherical.
4. Enchelis: Cylindracea. Cylindrical.
5. Vibrio: Elongatum. Long.
   * Membranaceous.
6. Cyclidium: Ovale. Oval.
7. Paramecium: Oblongum. Oblong.
8. Kolpoda: Sinuatum. Sinuous.
8. Gonium: Angulatum. With angles.
10. Burſaria. Hollow like a purſe.

II. *Thoſe that have external organs.*

* Naked, or not incloſed in a ſhell.
1. Cercaria: Caudatum. With a tail.
2. Trichoda: Crinitum. Hairy.
3. Kerona: Corniculatum. With horns.
4. Himantopus: Cirratum. Cirrated.
5. Leucophra: Ciliatum undique. Every part ciliated.
6. Vorticella: Ciliatum apice. The apex ciliated.
   * Covered with a ſhell.
7. Branchionus: Ciliatum apice. The apex ciliated

I. *Monas.*

This is by our author defined to be "an inviſible (to the naked eye), pellucid, ſimple, punctiform worm;" but of which, ſmall as it is, there are ſeveral ſpecies.

1. The *monas termo* or *gelatinoſa*, is a ſmall jelly-like point, which can be but imperfectly ſeen by the ſingle microſcope, and not at all by the compound one. In a full light they totally diſappear, by reaſon of their tranſparency. Some infuſions are ſo full of them that ſcarce the leaſt empty ſpace can be perceived; the water itſelf appearing compoſed of innumerable globular points, in which a motion may be perceived ſomewhat ſimilar to that which is obſerved when the ſun's rays ſhine on the water; the whole multitude of animals appearing in commotion like a hive of bees. This animal is very common in ditch-water, and in almoſt all infuſions either of animal or vegetable ſubſtances.

2. *Monas atomus* or *albida;* white monas with a variable point. This appears like a white point, which thro' a high magnifier appears ſomewhat egg-ſhaped. The ſmaller end is generally marked with a black point, the ſituation of which is variable; ſometimes it appears on the large end, and ſometimes there are two black ſpots in the middle. This ſpecies was found in ſea water, which had been kept through the whole winter, but was not very fetid. No other kind of animalcule was found in it.

3. *Monas punctum* or *nigra*, black monas. This was found in a fetid infuſion of pears, and appears in form of a very minute, opaque, and black point, moving with a ſlow and wavering motion.

4. *Monas ocellus*, tranſparent like talc, with a point in the middle. This is found in ditches covered with conferva,

ſerva, and ſometimes with the cyclidium milium; the margin of it is black, with a black point in the middle.

5. *Monas lens* or *hyalina*; of a talcy appearance. This is found in all kinds of water; ſometimes even in that which is pure, but always in the ſummer-time in ditch-water. It is found alſo in all infuſions of animal or vegetable ſubſtances, whether in freſh or ſalt water; myriads being contained in a ſingle drop. It is found likewiſe in the filth of the teeth. It is nearly of a round figure; and ſo tranſparent, that it is impoſſible to diſcover the leaſt veſtige of inteſtines. They generally appear in cluſters, but ſometimes ſingly. Contrary to what happens to other animalcules, they appear to cover the edges of the drop when evaporating, and where they inſtantly die. A few dark ſhades, probably occaſioned by the wrinkling of the body, are perceived when the water is nearly evaporated. The motions of this animalcule are generally very quick; and two united together, may ſometimes be ſeen ſwimming among the reſt; which is thought to be a ſingle one generating another by diviſion, as is related under the article Aimalcule. Theſe and the animalcules of the firſt ſpecies are ſo numerous, that they exceed all calculation even in a very ſmall ſpace.

6. *Monas mica*, marked with a circle. This is found in the pureſt waters, and may be diſcovered with the third lens of the ſingle microſcope when the magnifying power is increaſed. It appears like a ſmall lucid point; but can aſſume an oval or ſpherical ſhape at pleaſure: ſometimes the appearance of two kidneys may be perceived in its body, and there is commonly the figure of an ellipſe in it; the ſituation of which is moveable, ſometimes appearing in the middle and ſometimes approaching to either extremity. It ſeems encompaſſed with a beautiful halo, which is thought to be occaſioned by the vibration of fine inviſible hairs. It has a variety of motions, and often turns round for a long time in the ſame place.

7. The *tranquilla*, or egg-ſhaped tranſparent monas with a black margin, is found in urine which has been kept for ſome time. Urine in this ſtate acquires a ſcum in which the animalcules reſide; but though kept for ſeveral months, no other ſpecies was found in it. A drop of urine is uſually fatal to other animalcules, though this ſpecies is to be met with in no other ſubſtance. It is generally fixed to one point, but has a kind of vacillatory motion. Frequently theſe creatures are ſurrounded with a halo. Sometimes they are quadrangular, and at other times ſpherical; the black margin is not always to be found; and ſometimes there is even an appearance of a tail.

8. The *lamellula*, or flat tranſparent monas, is moſt uſually found in ſalt-water; is of a whitiſh colour and tranſparent, more than twice as long as it is broad, with a dark margin, having a vacillatory motion, and frequently appearing as double.

9. The *pulviſculus* or *monas* with a green margin. Theſe are generally found in marſhy grounds in the month of March. They appear like ſmall ſpherical grains of a green colour on the circumference, having ſometimes a green bent line paſſing through the middle. They appear ſometimes in cluſters, from three to ſeven or more in number, having a wavering kind of motion.

10. The *uva*, or tranſparent gregarious mona, is found in a variety of infuſions, and is of that kind which multiplies by dividing itſelf. They appear in cluſters of four, five, or ſometimes many more; the corpuſcles being of various ſizes, according to the number collected into one group. The ſmaller particles, when ſeparated from the larger, move about with incredible ſwiftneſs. A ſingle corpuſcle ſeparated from the heap, and put by itſelf into a glaſs, ſoon increaſed in ſize till it nearly attained the bulk of the parent group. The ſurface then aſſumed a wrinkled appearance, and gradually became like the former, ſeparating again into ſmall particles, which likewiſe increaſed in bulk as before.

II. *The proteus.*

An inviſible, very ſimple, pellucid worm, of a variable form.

1. The *diffluens*, branching itſelf out in a variety of directions. It is very rare, and only met with in fens; appearing like a grey mucous maſs, filled with a number of black globules, and continually changing its figure, puſhing out branches of different lengths and breadths. The internal globules divide immediately, and paſs into the new formed parts; always following the various changes of the animalcule; which changes ſeem to proceed entirely from the internal mechaniſm of its body, without the aid of any external power.

2. The *tenax*, running out into a fine point. This is a pellucid gelatinous body, ſtored with black molecules, and likewiſe changing its figure, but in a more regular order than the former. It firſt extends itſelf in a ſtraight line, the lower part terminating in a bright acute point. It appears to have no inteſtines; and when the globules are all collected in the upper part, it next draws the pointed end up toward the middle of the body, which aſſumes a round form. It goes through a number of different ſhapes, part of which are deſcribed under the article Animalcule. It is found in ſome kinds of river-water, and appears confined almoſt entirely to one place, only bending ſidewiſe.

III. *Volvox.*

An inviſible, very ſimple, pellucid, ſpherical worm.

1. The *punctum*; of a black colour, with a lucid point. This is a ſmall globule, with one hemiſphere opaque and black, the other having a cryſtalline appearance; and a vehement motion is obſerved in the black part. It moves as on an axis, frequently paſſing through the drop in this manner. Many are often ſeen joined together in their paſſage through the water; ſometimes moving as in a little whirlpool, and then ſeparating. They are found in great numbers on the ſurface of fetid ſea-water.

2. The *granulum* is of a ſpherical figure and green colour, the circumference being bright and tranſparent. It is found in marſhy places about the month of June, and moves but ſlowly. It ſeems to have a green opaque nucleus.

3. The *globulus*, with the hinder part ſomewhat obſcure, ſometimes verges a little towards the oval in its ſhape, having a ſlow fluttering kind of motion, but

more quick when diſturbed. The inteſtines are but juſt viſible. It is found in moſt vegetable infuſions, and is ten times larger than the mona lens.

4. The *pilula*, ſmall and round, with green inteſtines. This is found in water where the lemna minor grows, in the month of December, and has a kind of rotatory motion, ſometimes ſlow and at others quick. The inteſtines are placed near the middle, apparently edged with yellow. There is a ſmall inciſion on one of the edges of the ſphere, which may poſſibly be the mouth of the creature. The whole animal appears encompaſſed with a halo.

5. The *grandinella*, with immoveable inteſtines, is much ſmaller than the laſt, and marked with ſeveral circular lines. The inteſtines are immoveable, and no motion is perceived among the interior molecules. Sometimes it moves about in a ſtraight line, at others irregularly, and ſometimes keeps in the ſame ſpot, with a tremulous motion.

6. The *ſocialis*, with cryſtalline molecules placed at equal diſtances from one another. This is found in water where the chara vulgaris has been kept; and has its molecules diſpoſed in a ſphere, filling up the whole body of the animalcule; but whether they be covered by a common membrane or united by a ſtalk (as in the *vorticella ſocialis* to be afterwards deſcribed) is not known. When very much magnified, ſome black points may be ſeen in the cryſtalline molecules. Its motion is ſometimes rotatory and ſometimes not.

7. The *ſphericula*, with round molecules, appears to conſiſt of pellucid homogeneous points of different ſizes. It moves ſlowly from right to left and back again, about a quarter of a circle each time.

8. The *lunula*, with lunular molecules, is a ſmall roundiſh tranſparent body, conſiſting of an innumerable multitude of homogeneous molecules of the ſhape of a creſcent, without any common margin. It moves continually in a twofold manner, *viz.* of the molecules among one another, and the whole maſs turning ſlowly round. It is found in marſhy places in the beginning of ſpring.

9. The *globator*, or ſpherical membranaceous volvox is found in great numbers in the infuſions of hemp and tremella, and in ſtagnant waters in ſpring and ſummer it was firſt obſerved and depicted by Leewenhoeck, but the deſcriptions of it given by authors differ conſiderably from each other. The following is that of Mr Baker. "There is no appearance of either head tail or fins. It moves in every direction, backwards, forwards, up or down, rolling over and over like a bowl, ſpinning horizontally like a top, or gliding along ſmoothly without turning itſelf at all; ſome times its motions are very ſlow, at other times very ſwift and when it pleaſes it can turn round as upon an axis very nimbly, without moving out of its place. The body is tranſparent, except where the circular ſpots are placed, which are probably its young. The ſurface of the body in ſome is as if all dotted over with little points, and in others as if granulated like ſhagreen. In general it appears as if ſet round with ſhort moveable hairs." Another author informs us that "they are at firſt very ſmall, but grow ſo large that they can be diſcerned with the naked eye: they are of a yellowiſh green colour, globular figure, and in ſubſtance membranaceous and tranſparent; and in the midſt of this ſubſtance ſeveral ſmall globes may be perceived. Each of theſe are ſmaller animalcula, which have alſo the diaphanous membrane, and contain within themſelves ſtill ſmaller generations, which may be diſtinguiſhed by means of very powerful glaſſes. The larger globules may be ſeen to eſcape from the parent, and then increaſe in ſize."

This little animal appears like a tranſparent globule of a greeniſh colour, the fœtus being compoſed of ſmaller greeniſh globules. In proportion to its age it becomes whiter and brighter, and moves ſlowly round its axis; but to the microſcope its ſurface appears as if granulated, the roundeſt molecules fixed in the centre being largeſt in thoſe that are young. The exterior molecules may be wiped off, leaving the membrane naked. When the young ones are of a proper ſize, the membrane opens, and they paſs through the fiſſure; after which the mother melts away. Sometimes they change their ſpherical figure, and become flat in ſeveral places. They contain from 8 to between 30 and 40 globules within the membrane.

10. The *morum*, with ſpherical green globules in the centre. This is found amongſt the lemna in the months of October and December, and has a ſlow rotatory motion. The globules ſeldom move, though a ſlow quivering motion may ſometimes be perceived among them in the centre.

11. The *alva*, compoſed of green globules not incloſed in any membrane, is found in the month of Auguſt in water where the lemma polyrrhiza grows. —It conſiſts of a congeries of greeniſh-coloured globules, apparently of an equal ſize, with a bright ſpot in the middle; the whole maſs is ſometimes of a ſpherical form, ſometimes oval, without any common membrane: a kind of halo may be perceived round it, and the maſs generally moves from right to left, but ſcarce any motion can be perceived among the globules themſelves. Theſe maſſes contain from four to fifty globules, of which a ſolitary one may ſometimes be ſeen. Sometimes alſo two maſſes of globules have been perceived joined together.

12. The *vegetans*, terminating in a little bunch of globules. This is found in river-water in the month of November. It conſiſts of a number of floccoſe opaque branches inviſible to the naked eye; and at the apex of theſe is a ſmall congeries of very minute oval pellucid corpuſcles. Muller, who diſcovered this ſuppoſed it at firſt to be a ſpecies of microſcopic and river ſertularia: but he afterwards found the bunches quitting the branches, and ſwimming about in the water with a proper ſpontaneous motion; many of the old branches being deſerted, and the younger ones furniſhed with them.

IV. *Enchelis:*
A ſimple, inviſible, cylindric worm.

1. The *viridis*, or green enchelis has an obtuſe tail, the forepart terminating in an acute truncated angle; the inteſtines are obſcure and indiſtinct. It continually varies its motion, turning from right to left.

2. The *punctifera*, having the fore part obtuſe, the hinder part pointed. It is opaque, and of a green colour, with a ſmall pellucid ſpot in the fore part, in which two black points may be ſeen; and a kind of

double band croſſes the middle of the body. The hinder part is pellucid and pointed, with an inciſion ſuppoſed to be the mouth, at the apex of the fore-part. It is found in marſhes.

3. The *deſes*, or gelatinous enchelis, is found, though rarely, in an infuſion of lemnæ, and moves very ſlowly. The body is round, of a very dark-green, the fore-part bluntly rounded off, and the hinder part ſomewhat tapering, but finiſhed with a round end: near the extremities there is a degree of tranſparency.

4. The *ſimilis*, with moveable inteſtines, is found in water that has been kept for ſeveral months: it is of an egg-ſhape, and generally moves very quick either to the right or left. It is ſuppoſed to be furniſhed with hairs, becauſe when moving quickly the margin appears ſtriated. The body is opaque with a pellucid margin, and filled with moveable ſpherules.

5. The *ſerotina*, with immovable inteſtines, is of an oval figure, partly cylindrical, the fore-part ſmaller than the hind, with a black margin, full of gray veſicular molecules: it moves very ſlowly.

6. The *nebuloſa*, with viſible moveable inteſtines, is found in the ſame water with the cyclidium glaucoma but is much more ſcarce. The body is egg-ſhaped, the fore-part narrow, and frequently filled with opaque confuſed inteſtines: when moving, it elevates the fore-part of the body. It is about three times as large as the cyclidium glaucoma.

7. The *ſeminulum* is found in water that has been kept for ſome days, and moves by aſcending and deſcending alternately. It is of a cylindrical figure, twice as long as broad, the inteſtines in the fore-part tranſparent, but opaque in the hinder part. Sometimes it is obſerved ſwimming about with the extremities joined together.

8. The *intermedia*, with a blackiſh margin, is one of the ſmalleſt animalcules: it has a tranſparent body, without any viſible inteſtines. The fore and hind parts are of an equal ſize, and the edge is a deeper colour than the reſt. Some have a point of the middle, others a line paſſing through it.

9. The *ovulum*, is tranſparent, round, and egg-ſhaped. A very ſtrong magnifier diſcovers ſome long foldings on the ſurface, with a few bright molecules here and there.

10. The *pirum*, with the hinder part tranſparent, has the fore part portuberant and filled with molecules. The hinder part is ſmaller and empty, with moveable molecular inteſtines. Its motion is rapid, paſſing backwards and forwards through the diameter of the drop When at reſt, it appears to have a little ſwelling on the middle of the body.

11. The *tremula* was found in an infuſion with the paramæcia aurelia, and many other animalcules. It is among the leaſt of theſe minute creatures, and is of a cylindrical figure and gelatinous texture. Its extremity appears pointed, and has a tremulous motion, ſo as to induce a ſuſpicion that the creature has a tail. Two of theſe creatures may at times be ſeen to adhere together.

12. The *conſtricta*, with a ſtricture in the middle is found in ſalt-water, and is of a very ſmall ſize, having the middle drawn in as if tied with a ſtring. It is of an oval ſhape.

13. The *elliptica*, with a congeries of green inteſtines, is found among the green matter on the ſides of veſſels in which water has been kept for ſome time. It is of a roundiſh ſhape, and tranſparent; the fore part obtuſe, the hinder part rather ſharp, and marked with green ſpots. They are generated in ſuch numbers, that myriads may ſometimes be found in one drop.

14. The *ſuſus*, with both ends truncated, was found in water called pure, and had a languid motion. The body is round and tranſparent, with the fore and hind parts ſomewhat ſmaller than the reſt. In the in ſide is a long and ſomewhat winding inteſtine, with a bright ſky-coloured fluid, and ſome black molecules tranſverſely ſituated.

15. The *fritillus*, with the fore-part truncated, is found in an infuſion of graſs and hay, and runs backward and forward through the drop with a wavering motion. It is one of the moſt tranſparent animalcules, and has the fore-part obtuſely convex.

16. The *caudata*, with a kind of tail, is but ſeldom met with. The body is grey and tranſparent, with globular molecules divided from each other, and diſperſed thro' the whole; the fore-part is thick and obtuſe, the hind part cryſtalline and ſmall, the end truncated.

17. The *epiſtomium*, with the fore-part ſlender and roundiſh, is among the ſmaller animalcula; the body cylindrical and bright, the hind part obtuſe, the fore-part ſmaller, and terminating in a globule, with now and then a black line down the middle.

18. The *gemmata* is found in ditch-water where the lemna thrives. It has a cylindrical body, the upper part running out into a tranſparent neck, with a double ſeries of globules running down the body. It moves ſlowly and generally in a ſtraight line.

19. The *retrograda* moves commonly ſideways, and ſometimes in a retrograde manner. It has a gelatinous tranſparent body, thicker in the middle than at the ends, without any thing that can be called inteſtines except a pellucid globule diſcoverable near the hinder part.

20. The *feſtinans*, with obtuſe ends, is found in ſea-water, and has a quick vacillatory motion from one ſide to the other. The body is round, with the fore-part tranſparent. More than half the length of it is without any viſible inteſtines; but the lower end is filled with minute veſicular and tranſparent globules; a large globular veſicle is obſerved in the fore part.

21. The *furcimen* was found by Joblot in an infuſion of blue bottles moving very ſlowly in an undulatory manner. The body is cylindrical, about four times as long as broad, truncated at both ends, the inteſtines opaque, and not to be diſtinguiſhed from one another. It forms itſelf into the ſhape of the letter *S*, by turning the two extremities contrariwiſe.

22. The *index* is found in water with the lemna minor; the body opaque, of a grey colour, and long conical ſhape: the lower end is obtuſe, one ſide projecting like a finger from the edge, with two very ſmall projections from the lower end. It has the power of retracting theſe projections, and making both ends appear obtuſe.

23. The *truncus*, with a kind of head, is the largeſt of this kind of animalcules. The body is grey, long, and mucous; the fore-part globular, the hinder part obtuſe; but it can alter its ſhape conſiderably. Sometimes there is an appearance of three teeth proceeding

from one of the ſides. Globules of different ſizes may be obſerved within the body. The creature rolls ſlowly about from right to left.

24. The *larva* is long, round and filled with molecules. The fore-part is obtuſe and tranſparent, with a kind of neck or ſmall contraction formed near this end: the lower end is pointed; and about the middle of the body are two ſmall pointed projections like nipples, one on each ſide.

25. The *ſpatula*, with the fore-part tranſparent, and of the ſhape of a ſpatula. It is perfectly cylindrical, cryſtalline, and marked with fine longitudinal furrows; having generally two tranſparent globules, one below the middle, the other near the extremity. It moves in a wavering kind of manner, retaining its general form, but moving the ſpatula in various ways. Muller informs us, that he ſaw it once draw the ſpatula within the body, and keep it there for two hours.

26. The *pupula*, with the fore-part papillary, is found in dunghill water in November and December: it has a rotatory motion on a longitudinal axis, and moves in an oblique direction through the water. Both ends are obtuſe; and the hinder part is marked with a tranſparent circle, or circular aperture.

27. The *pupa*, with a ſmall nipple proceeding from the apex, has a very ſlow motion, and reſembles the former, only that it wants the tranſparent circle, and is much larger. It is all opaque but the fore-end and filled with obſcure points.

V. *Vibrio:*

A very ſimple, inviſible, round, and rather long worm.

1. The *lineola* is found in moſt vegetable infuſions in ſuch numbers, that it ſeems to fill up almoſt the whole of their ſubſtance. It is ſo ſmall, that with the beſt magnifiers we can diſcern little more than an obſcure tremulous motion among them. It is more ſlender than the monas terma.

2. The *rugola* is like a bent line; and ſometimes draws itſelf up in an undulated ſhape, at others moves without bending the body at all.

3. The *bacillus*, equally truncated at both ends, is found in an infuſion of hay; but Muller mentions the following remarkable fact, *viz.* that having made two infuſions of hay in the ſame water he put the hay whole in the one, but cut it in pieces in the other: he found in the former none of the vibrio bacillus, but many of the monas, lens and kolpoda cucullus; in the latter were many of the vibrio, but few of the other.—This is from ſix to ten times longer than the monas lens, but much more ſlender.

4. The *undula*, is a round, gelatinous, little, undulating line. This is the animal which Leewenhoeck ſays is leſs than the tail of one of the ſeminal animalcules. It never appears ſtraight; but when at reſt it reſembles the letter V, and when in motion the letter M. It commonly reſts on the top of the water; ſometimes it fixes itſelf by one extremity, and whirls round.

5. The *ſerpens*, with obtuſe windings or flexures, is found in river-water, but ſeldom. It is ſlender, and gelatinous, reſembling a ſerpentine line, with an inteſtine down the middle.

6. The *ſpirillum* is exceedingly minute, and twiſted in the form of a ſpiral, which ſeems to be its natural ſhape, as it never untwiſts itſelf, but moves forward in a ſtraight line, vibrating the hind and fore-parts. It was found in 1782 in an infuſion of the ſonchus arvenſis.

7. The *vermiculus* has a milky appearance, with an obtuſe apex, and a languid undulatory motion, like that of the common worm. It is found in marſhy water in November, but ſeldom. It is thought to be the animal mentioned by Leewenhoeck as found in the dung of the frog and ſpawn of the male libellula.

8. The *inteſtinum*, is found in marſhy waters, and has a ſlow progreſſive motion. It is milk-coloured, with two obtuſe ends, and four or five ſpherical eggs are perceivable at the hinder extremety.

9. The *bipunctatus* is found in fetid ſalt-water, and moves ſlowly; for the moſt part in a ſtraight line. The body is pellucid, and of a talc-like appearance; both ends are truncated, and in the middle one or two pellucid globules placed lengthwiſe.

10. The *tripunctatus* is alſo tranſparent and talcy, with both ends tapering. It has three pellucid globules, the middle one of which is largeſt, the ſpace between them being generally filled with a green matter. It moves in a ſtraight line, backwards and forwards.

11. The *paxilifer*, or ſtraw-like vibrio, conſiſts of a tranſparent membrane, with yellow inteſtines, and two or three viſible points. They are found in parcels together from ſeven to forty in number, and ranged in a variety of forms. When at reſt, they generally aſſume a quadrangular figure; and are thought to have ſome affinity to the *hair-like animal* deſcribed by Mr Baker, and of which an account is given under the article Animalcule, n° 3.

12. The *lunula*, or bow-ſhaped vibrio, reſembles the moon at its firſt quarter; it is of a green colour, and has from ſeven to ten globules diſpoſed in a longitudinal direction.

13. The *verminus* is found in great plenty in ſalt water kept for ſome days till it becomes fetid. It moves quickly, and with an undulatory motion, backwards and forwards. It has a long tranſparent membrane, with the hind part broader than the fore one. Theſe animalcula ſeem to be joined together in a very ſingular manner.

14. The *malleus* is found in great plenty in ſpring-water and is alternately at reſt and in motion every moment; in the former caſe reſembling the letter T, and in the latter V. It is a white pellucid animalcule, with a globule affixed to the baſe.

15. The *acus* in the ſhape of a ſewing needle; the neck round and partly tranſparent, and marked in the middle with a red point; the tail reſembling a fine briſtle.

16. The *ſagitta*, with a ſetaceous tail, has a long and flexible body; broadeſt about the middle, and filled there alſo with grey molecules; the fore-part being drawn out into a thin and tranſparent neck, and the upper end thick and black. It is found in ſalt-water, and ſeems to move by contracting and extending its neck.

17. The *gordius*, with a tail terminated by a ſmall tubercle, was found in an infuſion made with ſalt water. Its fore part throughout about one ſixth of its length is tranſparent, and furniſhed with an alimentary tube of a ſky colour; the lower part be-

ing bright and pointed, and the middle full of ſmall globules.

18. The *ſerpentulus*, ſomewhat pointed at both ends. This is found in the infuſions of vegetables which have been kept for ſome weeks. Its body is of a whitiſh colour, frequently convoluted, and drawn into different figures. The tail is furniſhed with a long row of very minute points.

19. The *coluber* is found in river-water; the tail is extremely ſmall, and bent ſo as to form a conſiderable angle with the body; the mouth, œſophagus, the molecules in the inteſtines, and the twiſtings of them, are eaſily diſcerned.

20. The *anguillula* is divided into four varieties: 1. The vinegar eel; 2. That in paſte; 3. That of freſh water; and, 4. That of ſalt. The two firſt are treated of under the article Animalcule; the third is exceedingly tranſparent, with a few tranſverſe lines upon the body, but without any appearance of inteſtines. Sometimes it has a long row of little globules, and is frequently furniſhed with two ſmall oval ones: the tail terminates in a point. It has been found in the ſediment formed by vegetables on the ſides of veſſels in which water had been kept for a long time. The fourth variety appears, when preſſed between two glaſs plates, to be little more than two cryſtalline ſkins with a kind of inteſtines of a clay colour. The younger ones are furniſhed with pellucid molecules.

21. The *linter*, or ventricoſe oval vibrio, with a ſhort neck, is found among the *lemnæ*, but not very frequently. It is among the larger kinds of animalcules, egg-ſhaped, pellucid, inflated, and ſomewhat depreſſed at top; having a moveable cryſtalline neck, and the belly filled with pellucid molecules.

22. The *utriculus* reſembles a bottle; the belly is full of molecular inteſtines, the neck bright and clear the top truncated, and ſome have a pellucid point at the bottom of the belly. It has a conſtant and violent vacillatory motion, the neck moving very quickly from ſide to ſide.

23. The *faſciola* is found in water juſt freed from the froſt, and not often in any other fluid. It is pellucid, with inteſtines like points in the middle. There is likewiſe an alimentary canal gradually diminiſhing in ſize. Its motion is very quick.

24. The *colymbus* is larger than many of the other ſpecies of vibrio, and reſembles a bird in ſhape. The neck, which is a little bent, is round, ſhorter than the trunk, of an equal ſize throughout, and of a bright appearance, with the apex obtuſe. The trunk is thick, ſomewhat triangular, full of yellow molecules; the fore-part broad, the hinder part acute, the motion ſlow.

25. The *ſtrictus* has a linear body, being a bright membranaceous thread; the hinder part ſomewhat thicker, round, and filled with molecules, excepting at the end, where there is a ſmall empty pellucid ſpace. It can draw in the ſlender filiform part at pleaſure.

26. The *anas*, with both ends attenuated, and the neck longer than the tail, is found in ſalt water; tho' a kind is likewiſe found in freſh water with a neck longer than the other. The trunk of this animalcule is oblong, opaque, and filled with molecules; the fore and hind parts are drawn out into a pellucid talcy membrane, which the creature can retract at pleaſure.

27. The *cygnus* is a very pellucid line, crooked at top, ſwelling in the middle, and ſharp at the end; the middle full of dark coloured molecules and pellucid inteſtines. It is very ſmall, and moves more ſlowly than any of thoſe that move and advance their necks.

28. The *anſer* is found in water where duckweed grows. The trunk is elliptic, round, and without any inequallity on the ſides. It it full of molecules; the hind part ſharp and bright; the fore part produced into a bending neck, longer than the body; the apex whole and even, with blue canals paſſing between the marginal edges, occupying the whole length of the neck; and in one of them a violent deſcent of water to the beginning of the trunk is obſervable. It moves the body ſlow, but the neck more briſkly.

29. The *olor* is found in water that has been kept for a long time, and is full of vegetable green matter. The body is elliptical and ventricoſe, the hind part ſomewhat ſharp, and ſometimes filled with darkiſh molecules. The neck is three or four times longer than the body; of an equal ſize throughout, and is moved very quicky; but the motion of the body itſelf is ſlow.

30. The *falx*, with a crooked neck, and obtuſe hinder part, is pellucid and elliptical; the fore part leſſening into a little, round, bright neck, nearly as long as the trunk. The latter is ſomewhat gibbous, and filled with very ſmall molecules; and there are two ſmall bright globules, one within the hind extremity, and the other in the middle of the body. The neck of this animalcule is immoveable; whence it moves ſomething like a ſcythe.

31. The *intermedius* appears to be an intermediate ſpecies betwixt the falx and the faſciola. It ſeems to be a thin membrane conſtantly folded. The whole has a cryſtalline talcy appearance; the middle filled with grey particles of different ſizes. It has all round a diſtinct bright margin.

VI. *Cyclidium.*

A ſimple, inviſible, flat, pellucid, orbicular or oval worm.

1. The *bulla*, or orbicular bright cyclidium. This is found occaſionally in an infuſion of hay. It is very pellucid and white, but the edges ſomewhat darker than the reſt. It moves ſlowly, and in a ſemicircular direction.

2. The *millium* is very pellucid, and, ſplendid like cryſtal; and of an elliptical figure, with a line through the whole length of it. The motion is ſwift, interrupted, and fluttering.

3. The *fluitans* is one of the ſmalleſt animalcula; the body ſomewhat of an oval ſhape, with two ſmall blue ſpaces at the ſides.

4. The *glaucoma* has an oval pellucid body, with both ends plain, or an oval membrane with a diſtinct well-defined edge. The inteſtines are ſo tranſparent, that they can ſcarce be diſcerned when it is empty. When full, they are of a green colour, and there are dark globules diſcoverable in the middle. When there is plenty of water this animalcule moves ſwiftly in a circular and diagonal direction; when it moves ſlowly, it ſeems to be taking in water, and the inteſtines are in a violent commotion. It generates by diviſion.

5. The *nigricans* is very ſmall, pellucid, and flat, with a black margin.

6. The *roſtratum* is oval, ſmooth, and very pellucid, with the fore part running out into an obtuſe point, with which it ſeems to feel and examine the bodies to which it comes. The inteſtines are filled with a blue liquor, the colour of which ſometimes vaniſhes, and then they ſeem to be compoſed of veſicles.

7. The *nucleus* reſembles a grape ſeed, the body being pellucid and depreſſed, the fore part obtuſely convex, and the hind part acute.

8. The *hyalinum* has a tremulous kind of motion; the body oval, flat, and bright, without any viſible inteſtines.

9. The *pediculus* is ſcarce ever ſeen but on the hydra pallida, upon which it runs as if it had feet. It is gelatinous and white; the bottom gibbous over the back; the extremities depreſſed and truncated, with one end ſometimes apparently cloven into two, which may be ſuppoſed the mouth.

10. The *dubium* is of an oval ſhape, with one ſide convex the other concave; the margin pellucid, and the inner part containing a great number of molecules.

VII. *Paramæcium.*

An inviſible, membranaceous, flat, and pellucid worm.

1. The *aurelia* is membranaceous, pellucid, and four times longer than it is broad; the fore part obtuſe and tranſparent; the hind part filled with molecules. It has ſomewhat the appearance of a gimlet by reaſon of a fold which goes from the middle to the apex, and is of a triangular figure. It moves in a rectilinear and vacillatory manner. It is found in ditches where there is plenty of duckweed, and will live many months in the ſame water without any renewal of the latter.

2. The *chryſalis* is found in ſalt water, and differs very little from the former, only the ends are more obtuſe, and the margins are filled with black globules.

3. The *verſutum* is found in ditches, and has an oblong, green, and gelatinous body, filled with molecules; the lower part thicker than the other; and both ends obtuſe. It propagates by diviſion.

4. The *oviferum* is membranaceous, oval, grey, and pellucid, with many oval corpuſcles diſperſed through the body.

5. The *marginatum* is flat, elliptical, and every where filled with molecules, except in the lower end where there is a pellucid veſicle. It is ſurrounded by a broad double margin, and a bright ſpiral inteſtine is obſervable.

VIII. *Kolpoda.*

An inviſible, pellucid, flat, and crooked worm.

1. The *lamella* is very ſeldom met with. It reſembles a long, narrow, and pellucid membrane, with the hind part obtuſe, narrower, and curved towards the top. It has a vacillatory and very ſingular motion; going upon the ſharp edge, not on the flat ſide as is uſual with microſcopic animals.

2. The *gallinula* is found in fetid ſalt water; and has the apex ſomewhat bent, the belly oval, convex, and ſtriated.

3. The *roſtrum* is found though ſeldom, in water where the lemna grows; and has a ſlow and horizontal motion. The fore part is bent into a kind of hook; the hind part obtuſe, and quite filled with black molecules.

4. The *ochrea* is depreſſed, membranaceous, and flexible; one edge nearly ſtraight; the other ſomewhat bent, filled with obſcure molecules, and a few little bladders diſperſed here and there.

5. The *mucronata* is a dilated bright membrane; the apex an obtuſe point, with a broad marked border running quite round it. It is filled with grey molecules within the margin, and has a truncated appearance.

6. The *triquetra* was found in ſalt water, and appears to conſiſt of two membranes; the upper ſide flattened, the lower convex, with the apex bent into a kind of ſhoulder.

7. The *ſtriata* is likewiſe found in ſalt water, and is very pellucid and white, with the upper part rather bent, and terminating in a point; the lower part obtuſely round: there is a little black pellucid veſicle at the apex; and with a very great magnifying power the body appears covered with long ſtreaks.

8. The *nucleus* is of an oval ſhape, with the vertex pointed, and of a brilliant tranſparency, by which the viſcera are rendered viſible. Theſe conſiſt of a number of round diaphanous veſicles.

9. The *meleagris* has a dilated membrane, with very fine folds, which it varies in a moment. The fore part of the body to the middle is clear and bright; the hind part variouſly folded in tranſverſe and elevated plaits and full of molecules. Beneath the apex are three or four teeth; but in ſome the edge is obtuſely notched, and ſet with ſmaller notches. In the hinder part are 12 or more equal pellucid globules.

10. The *aſſimilis* is found on the ſea-coaſt, and has an elliptic maſs in the middle, but is not folded like the former. The margin of the fore part is notched from the top to the middle; the lower part ſwells out, and contracts again into a ſmall point.

11. The *cucullus* is found in vegetable infuſions, and in fetid hay; moving in all directions, and commonly with great vivacity. It is very pellucid, and has a well defined margin, filled with little bright veſicles differing in ſize, and of no certain number. Its figure is commonly oval, with the top bent into a kind of beak, ſometimes oblong, but moſt commonly obtuſe. It has in the inſide from 8 to 24 bright little veſicles not diſcernible in ſuch as are young. Some have ſuppoſed theſe to be animalcules which this creature has ſwallowed; but Mr Muller is of opinion that they are its offſpring. When this creature is near death by reaſon of the evaporation of the water, it protrudes its offſpring with violence. From ſome circumſtances it would ſeem probable that this animalcule caſts its ſkin, as is the caſe with ſome inſects.

12. The *cucullulus* is found in an infuſion of the ſonchus arvenſis. It is very pellucid and cryſtalline, with ſeveral globules, and has an oblique inciſion a little below the apex.

13. The *cuculio* is elliptical, flat on the upper ſide, and convex on the under; the fore part is clear, and from the middle to the hinder part is full of ſilver-like globules. It frequently ſtretches out the fore part, and folds it in different poſitions.

14. The *ren*, or *craſſa*, is found in an infuſion of hay, commonly about 13 hours after the infuſion is made, and has a quick and vacillatory motion. Its body is yellow, thick, and ſomewhat opaque; curved a little in the middle, ſo that it reſembles a kidney; and full of molecules. When the water in which it ſwims is about to fail, it takes an oval form, is compreſſed, and at laſt burſts.

15. The *pirum* has an uniform and tranſparent body, without any ſenſible inequality; and is of a pale colour, with obſcure little globules. It propagates by diviſion.

16. The *cuneus* is white, gelatinous, and without any diſtinct viſcera; having a bright ſtriated pellucid puſtule on one ſide of the fore-part. The apex has three or four teeth; and it can bend the hinder part into a ſpiral form.

IX. *Gonium*

An inviſible, ſimple, ſmooth, and angular worm.

1. The *pectorale* is found in pure water, and moves alternately towards the right and left. It is quadrangular, and pellucid, with 16 ſpherical molecules of a greeniſh colour, "ſet in a quadrangular membrane, like the jewels in the breaſt-plate of the high-prieſt, reflecting light on both ſides."

2. The *pulvinatum* is found in dunghills; and appears like a little quadrangular membrane, plain on both ſides: but with a large magnifier it appears like a bolſter formed of three or four cylindric pillows ſunk here and there.

3. The *corrugatum* is found in various kinds of infuſions; and is ſomewhat of a ſquare ſhape, very ſmall and in ſome poſitions appears as ſtreaked.

4. The *rectangulum* differs but little from the former: the angle at the baſe is a right one; the larger veſicle is tranſparent, the reſt green.

5. The *truncatum* is found chiefly in pure water and then but ſeldom. It has a languid motion, and much larger than the foregoing. The fore part is a ſtraight line, with which the ſides form obtuſe angles, the ends of the ſides being united by a curved line. The internal molecules are of a dark green, and there are two little bright veſicles in the middle.

X. *Burſaria.*

A very ſimple, hollow, membranaceous worm.

1. The *truncatella* is viſible to the naked eye; white oval, and truncated at the top, where there is a large aperture deſcending towards the baſe. Moſt of them have four or five yellow eggs at the bottom. They move from left to right, and from right to left; aſcending to the ſurface in a ſtraight line, and ſometimes rolling about while they deſcend.

2. The *bullina* is pellucid and cryſtalline, having ſplendid globules of different ſizes ſwimming about with it. The under ſide is convex, the upper hollow, with the fore part forming a kind of lip.

3. The *hirundinella*, has two ſmall projecting wings, which give it ſomewhat of the appearance of a bird; and it moves ſomething like a ſwallow. It is inviſible to the naked eye; but by the microſcope appears a pellucid hollow membrane.

4. The *duplella* was found among duckweed, and appears like a cryſtalline membrane folded up, without any viſible inteſtines except a ſmall congeries of points under one of the folds.

5. The *globina* has a roundiſh ſhape, and is hollow; the lower end being furniſhed with black molecules of different ſizes, the fore part with obſcure points, the reſt entirely empty, and the middle quite tranſparent. It moves very ſlowly from right to left.

XI. *Cercaria.*

An inviſible tranſparent worm with a tail.

1 The *gyrinus* greatly reſembles the ſpermatic animalcules. It has a white gelatinous body; the fore part ſomewhat globular; the hind part round, long, and pointed. Sometimes it appears a little compreſſed on each ſide. When ſwimming it keeps its tail in continual vibration like a tadpole.

2. The *gibba* is found in the infuſions of hay and other vegetables; and is ſmall, opaque, gelatinous, white, and without any viſible inteſtines.

3. The *inquieta* is found in ſalt-water, and is remarkable for changing the ſhape of its body: ſometimes it appears ſpherical, ſometimes like a long cylinder, and ſometimes oval. It is white and gelatinous, the tail filiform and flexible, the upper part vibrating violently. A pellucid globule may be obſerved at the baſe, and two very ſmall black points near the top.

4. The *lemna* varies its form ſo much, that it might be miſtaken for the proteus of Baker, deſcribed under the article Animalcule; though in fact it is totally different. The body ſometimes appears of an oblong, ſometimes of a triangular, and ſometimes of a kidney ſhape. The tail is generally ſhort, thick, and annulated; but ſometimes long, flexible, cylindric, and without rings; vibrating, when ſtretched out, with ſo much velocity, that it appears double. A ſmall pellucid globule, which Muller ſuppoſes to be its mouth is obſervable at the apex; and two black points not eaſily diſcovered, he thinks, are its eyes. Sometimes it draws the tail entirely into the body. It walks ſlowly after taking three or four ſteps, and extends the tail, erecting it perpendicularly, ſhaking and bending it; in which ſtate it very much reſembles a leaf of the lemna.

5. The *turbo*, with a tail like a briſtle, is found among duckweed. It is of a talcy appearance, partly oval and partly ſpherical; and ſeems to be compoſed of two globular bodies, the lowermoſt of which is the ſmalleſt, and it has two little black points like eyes on the upper part. The tail is ſometimes ſtraight, ſometimes turned back on the body.

6. The *poduria* is found in November and December, in marſhy places covered with lemna. It is pellucid; and ſeems to conſiſt of a head trunk, and tail: the head reſembles that of a herring; the trunk is ventricoſe and full of inteſtines, of a ſpiral form and black colour. The tail moſt commonly appears to be divided into two briſtles. The inteſtines are in a continual motion when the body moves and by reaſon of their various ſhades make it appear very rough. There are likewiſe ſome hairs to be perceived. It turns round as upon an axis when it moves.

7. The *viridis*, is found in the ſpring in ditches of ſtanding water; and in ſome of its ſtates has a conſiderable reſemblance to the laſt, but has a much greater power of changing its ſhape. It is naturally cylindrical,

lindrical, the lower end ſharp, and divided into two parts; but ſometimes contracts the head and tail ſo as to aſſume a ſpherical figure.

8. The *ſetifera* is found in ſalt-water, but ſeldom. It is ſmall, the body rather opaque and of a round figure. The upper part is bright, and ſmaller than the reſt: the trunk is more opaque; the tail ſharp, and near it a little row of ſhort hairs. It has a ſlow rotatory motion.

9. The *hirta* was likewiſe found in ſalt-water. It is opaque and cylindrical; and when in motion, the body appears to be ſurrounded with rows of ſmall hairs ſeparated from each other.

10. The *crumena* has a ventricoſe, cylindrical, thick, and wrinkled body; the lower part ſmall; the upper part terminating in a ſmall ſtraight neck like that of a pitcher; the tail linear, and terminating in two diverging points,

11. The *catellus* has a moveable head fixed to the body by a point. The abdomen is twice as long as the head, full of inteſtines, and has a tail ſtill narrower, and terminating in two briſtles which it can unite and ſeparate at pleaſure. It moves briſkly, but without going far from its firſt place.

12. The *catelina* was found in a ditch where there was plenty of duckweed. It is larger than the preceding, and has a thicker and more cylindrical body; the lower part truncated, with two ſhort diverging points projecting from the middle.

13. The *lupus*, is found in water among duckweed, and is larger than moſt of the genus. The head is larger than the body; the apex turned down into a little hook; the tail is like the body, but narrower, terminating in two very bright ſpines, which it extends in different directions. Sometimes it contracts into one half its common ſize, and again extends itſelf as before.

14. The *vermicularis* is long, cylindrical, fleſhy, and capable of changing its ſhape. It is divided into eight or nine rings or folding plaits; the apex either obtuſe, or notched into two points; the hinder part rather acute and terminating in two pellucid thorns, between which a ſwelling is ſometimes perceived. It often projects a kind of cloven proboſcis from the inciſion at the apex. It is found in water where there is duckweed.

15. The *forcipata* is found in marſhy places, is cylindrical and wrinkled, with a forked proboſcis which it can thruſt out or pull in.

16. The *pleuronectes* is found in water which has been kept for ſeveral months. It is membranaceous, roundiſh, and white, with two blackiſh points in the fore part, the hinder part being furniſhed with a ſlender ſharp tail. It has orbicular inteſtines of different ſizes in the middle; the larger of them bright. The motion is vacillatory; and in ſwimming it keeps one edge of the lateral membrane upwards, the other folded down.

17. The *tripos* is flat, pellucid, triangular, having each angle of the baſe or fore part bent down into two linear arms, the apex of the triangle prolonged into a tail. It is found in ſalt water.

18. The *cyclidium* is frequently found in pure water, and has an oval, ſmooth, membranaceous, pellucid body with a black margin. The tail is concealed under the edge, and comes out from it at every motion, but in ſuch a manner as to project but little from the edge. There is alſo a kind of border to the hinder part.

19. The *tenax* appears like an oval pellucid membrane, ſomething larger than the *monas lens*. The fore edge is thick and truncated; the hinder part acute, and terminating in a ſhort tail. It whirls about in various directions with great velocity.

20. The *diſces* is a ſmall orbicular animalcule, with a bent tail.

21. The *orbis* is round, and has a tail conſiſting of two long briſtles.

22. The *luna* is likewiſe round, and has the fore-part hollowed into the form of a creſcent.

XII. *Leucophra*.

An inviſible, pellucid, and ciliated worm.

1. The *conflictor*, with moveable inteſtines, is perfectly ſpherical and ſemitranſparent, of a yellow colour, the edges dark. It rolls from right to left, but ſeldom removes from the ſpot where it is firſt found. It is filled with a number of the moſt minute molecules, which move as if they were in a violent conflict; and in proportion to the number of theſe little combatants which are accumulated either on one ſide or other, the whole maſs rolls either to the right or left. It then remains for a little time at reſt, and the conflict ceaſes; but it ſoon becomes more violent, and the ſphere moves the contrary way in a ſpiral line. When the water begins to fail, they aſſume an oblong, oval, or cylindric figure; the hinder part of ſome being compreſſed into a triangular ſhape, and the tranſparent part eſcaping as it were from the inteſtines, which continue to move with the ſame violence till the water fails, when the molecules ſhoot into a ſhapeleſs maſs, which alſo ſoon vaniſhes, and the whole aſſumes the appearance of cryſtals of ſal ammoniac.

2. The *mamilla* is of a dark colour, and filled with globular molecules; ſhort hairs are curved inwards; and it occaſionally projects and draws in a little white protuberance. It is pretty common in marſhy water.

3. The *vireſcens* is a large, pear-ſhaped, greeniſh-coloured animalcule, filled with opaque molecules, and covered with ſhort hairs; generally moving in a ſtraight line. It is found in ſalt water.

4. The *viridis* is much ſmaller than the former, and cannot lengthen or ſhorten itſelf as it does. Sometimes it appears contracted in the middle, as if it were to be divided in two.

5. The *burſata* is found in ſalt water, and is ſimilar in many reſpects to the former. It is of a long oval ſhape, bulging in the middle, and filled with green molecules, every where ciliated except at the apex, which is truncated and ſhaped ſomewhat like a purſe; the hairs are ſometimes collected into little faſcicles.

6. The *poſthuma* is globular, and covered as it were with a pellucid net; it is found in fetid ſalt water.

7. The *aurea* is yellow, oval; has both ends equally obtuſe; little hairs diſcovered with difficulty; and has in general a vehement rotatory motion.

8. The *pertuſa* is found in ſalt water; and is gelatinous.

tinous and ſmall, without any molecules. The fore-part is truncated, the hind-part brought nearly to a point, with a kind of oval hole on one ſide.

9. The *fracta* is long, with ſinuated angles, white, gelatinous, and granulated, changing its form conſiderably.

10. The *dilatata* appears like a gelatinous membrane, with a few grey molecules in the fore-part, and a great number in the hinder part. It is ſometimes dilated into a triangular form with ſinuated ſides; at other times the ſhape is more irregular and oblong.

11. The *ſcintillans* was found in December among the leſſer lemnæ. It is of a green colour, oval, round, and opaque. It is ſuppoſed to be ciliated from its bright twinkling appearance, which probably ariſes from the motion it gives the water.

12. The *veſiculifera* is oval, very pellucid, with a defined dark edge and inſide, containing ſome very bright bladders or veſicles. The middle frequently appears blue, and the veſicles appear as if ſet in a ground of that colour.

13. The *globulifera* was found in a ditch where the lemna minor grew. The body is round, very pellucid, without molecules, but with three little pellucid globules, and every where ſet with ſhort hairs.

14. The *puſtulata* is found in marſhy waters; and is white, gelatinous, and ſomewhat granulated; the lower part truncated as if an oblique ſection were made in an egg near the bottom. It is covered with little erect ſhining hairs, and at the lower extremity a few bright puſtules may be diſcovered.

15. The *turbinata* is found in ſtinking ſalt water; and is round, pellucid, ſomewhat of the ſhape of an acorn, with a pellucid globule at the lower end.

16. The *acuta* is found in ſalt water, and is gelatinous, thick, capable of aſſuming different ſhapes; having the apex bright, and the reſt of the body filled with little ſpherules. Sometimes it draws itſelf up into an orbicular ſhape, at others one edge is ſinuated.

17. The *notata* is oval, round, and has a black point at the edge.

18. The *candida* is found in ſalt water; and is membranaceous, flat, very white, with no viſible inteſtines except two oval bodies not eaſily perceived. The whole edge is ciliated.

19. The *nodulata* is oblong and oval, with a double row of little nodules.

20. The *ſignata* is common in ſalt water in the months of November and December. It is oblong and ſubdepreſſed, with a black margin filled with little molecules, but more particularly diſtinguiſhed by a curved line in the middle ſomewhat in the ſhape of the letter S; one end of which is ſometimes bent into the form of a ſmall ſpiral.

21. The *trigona* is found in marſhes, but not commonly. It is a yellow triangular maſs filled with unequal pellucid veſicles, one of which is much larger than the reſt, and the edge ſurrounded with ſhort fluctuating hairs.

22. The *fluida* is ſomewhat of a kidney ſhape, but ventricoſe.

23. The *fluxa* is reniform and ſinuated.

24 The *armilla* is round and annular.

25. The *cornuta* is of the ſhape of an inverted cone, opaque, and of a green colour. This requires to be obſerved for ſome time before we can aſcertain its characters. The body is compoſed of molecular veſicles; the fore part is wide and truncated, with a little prominent horn or hook on both ſides; the hind part being conical, every where ciliated, and the hairs exceedingly minute; thoſe in the fore part are three times longer than the former, and move in a circular direction. The hinder part is pellucid, and ſometimes terminates in two or three obtuſe pellucid projections. At one time this animalcule will appear reniform and ciliated on the fore part; but at another time the hairs are concealed. It diſſolves into molecular veſicles when the water evaporates.

26. The *heteroclita* appears to the naked eye like a white point; in the microſcope as a cylindrical body, the fore part obtuſely round, the middle rather drawn in; the lower part round, but much ſmaller than the upper part. It appears wholly ciliated through a large magnifier.

XIII. *Trichoda.*

An inviſible, pellucid, hairy worm.

1. The *grandinella* is a very ſmall pellucid globule, with the inteſtines ſcarce viſible, the top of the ſurface furniſhed with ſeveral ſmall briſtles not eaſily diſcoverable, as the creature has a power of extending or drawing them back in an inſtant. It is found in pure water as well as in infuſions of vegetables.

2. The *cometa* is a pellucid globule filled with bright inteſtines, the fore part furniſhed with hairs, the hind part with a pellucid globule.

3. The *granata* reſembles the two former; and has a darkiſh nucleus in the centre, with ſhort hairs on the edge.

4. The *trochus* is ſomewhat of a pear-ſhape, and pellucid; each ſide of the fore part being diſtinguiſhed by a little bunch of hairs.

5. The *gyrinus* is one of the ſmalleſt of this genus, and is found in ſalt water. It is ſmooth and free from hairs, except at the fore part, where there are a few.

6. The *ſol* is ſmall, globular, and cryſtalline; beſet every where with diverging rays longer than the diameter of the body; the inſide full of molecules. The body contracts and dilates, but the creature remains confined to the ſame ſpot. It was found with other animalcules in water which had been kept three weeks.

7. The *ſolaris* is orbicular, bright, and filled with globular inteſtines, frequently having in it a moveable ſubſtance of the ſhape of the letter S. It has hairs ſeldom exceeding 17 in number, ſet round the circumference, each of them nearly equal in length to the diameter of the animalcule.

8. The *bomba* is of a yellow colour, and full of clay-like molecules. It moves with ſuch velocity as to elude the ſight, and appears of various ſhapes, ſometimes ſpherical, ſometimes kidney-ſhaped, &c.

9. The *orbis* is compoſed of veſicular molecules; is of a ſpherical figure, ſmooth pellucid, and a little notched in the fore part. The notched part is filled with long hairs, but there are none on the reſt of the body.

10. The *urnula* is membranaceous, pellucid, ſomewhat in the form of a water pitcher, with the fore part hairy. It moves but ſlowly.

11. The *diota* is of a clay-colour, and filled with molecules;

molecules; the upper part cylindrical and truncated the lower part ſpherical, the upper part of the mouth hairy at the edges,

12. The *horrida* is ſomewhat of a conical ſhape, the fore part rather broad and truncated, the lower part obtuſe, and the whole covered with radiating briſtles.

13. The *urinarium* is egg-ſhaped, with a ſhort hairy beak.

14. The *ſemiluna* is ſmooth, pellucid, and ſhaped like a creſcent.

15. The *trigona* is of a triangular ſhape, a little convex on both ſides, the fore part acute and ciliated, the hind part broader, and having the extremity as it were gnawed off.

16. The *tinea* is round, not very pellucid, narrow in the fore part, and reſembling an inverted club.

17. The *nigra* was found in ſalt water, and has an opaque body; but when at reſt one ſide appears pellucid. When in violent motion, it ſeems entirely black.

18. The *pubes* is found in water where duckweed grows, chiefly in the month of December. It has a bunch above the hind part marked with black ſpots, depreſſed towards the top, a little folded, and ſomewhat convex on the under part. The apex is furniſhed with hairs, but they are ſeldom viſible till the creature is in the agonies of death, when it extends and moves them vehemently, and attempting as it were to draw in the very laſt drop of water.

19. The *floccus* is membranaceous, the fore part rather conical, with three ſmall hairy papillæ projecting from the baſe.

20. The *ſinuata* is found in river water. It is oblong and depreſſed, with one margin hollow and hairy, and the lower end obtuſe. It is of a yellow colour, and the hollow edge ciliated.

21. The *præceps* is pellucid, the fore part formed into a kind of neck; one edge riſing into a protuberance like a hump-back, the other edge convex.

22. The *proteus* is that which Mr Baker diſtinguiſhes by the ſame name, and of which an account is given under the article Animalcule. It is found in the ſlimy water adhering to the ſides of veſſels in which vegetables have been infuſed, or animal ſubſtances preſerved. That deſcribed by Mr Adams was diſcovered in the ſlime produced from the water where ſmall fiſhes, water-ſnails, &c. had been kept. The body reſembled that of a ſnail, the ſhape being ſomewhat elliptical, but pointed at one end, while from the other proceeded a long, ſlender, and finely proportioned neck, of a ſize ſuitable to the reſt of the animal.

23. The *verſatilis* lives in the ſea, and has ſome reſemblance to the proteus; but the neck is ſhorter, the apex leſs ſpherical, and the hinder part of the trunk acute.

24. The *gibba* is pellucid; the upper part ſwelled out, with numerous molecules, and three larger globules on the inſide. The ends rather inclined downwards; and when the water begins to fail, a few minute hairs may be diſcovered about the head and at the abdomen; the body then becomes ſtriated longitudinally.

25. The *foeta* ſomewhat reſembles a rolling pin in ſhape; has both ends obtuſe, and one ſhorter than the other. It can draw in the ends, and ſwell out the ſides, ſo as to appear almoſt ſpherical.

26. The *patens* is found in ſalt water; and is of a long cylindrical ſhape, filled with molecules, the fore-part bright and clear, with a long opening near the top which tapers to a point, and is beſet with hairs.

27. The *patula* is ventricoſe, rather inclining to an oval figure, with a ſmall tube at the fore part, the upper part of which is hairy.

28. The *foveata* is oblong and rather broad, with three little horns on the fore part.

29. The *ſtriata* is found in the month of December in river-water. It is a beautiful animalcule, of a fox colour. It is of an oblong ſhape, the lower end ſomewhat larger than the other. It has a ſet of ſtreaks running from one end to the other, and at the abdomen a double row of little eggs lying in a tranſverſe direction.

30. The *uvulva* is found in the infuſion of hay and other vegetables. It is ſix times longer than broad, round, flexuous, of an equal ſize, the greater part filled with obſcure molecules; the fore part rather empty, with an alimentary canal and lucid globules near the middle. The margin of the forepart is covered with ſhort hairs.

31. The *aurantia* is of a gold colour, pellucid, and filled with veſicles.

32. The *ignita* is of a fine purple colour, with ſomething of a reddiſh caſt, pellucid, ſplendid, with a number of globules of different ſizes; the fore part ſmall, the hinder part obtuſe, with a very large opening which ſeems to run through the body.

33. The *priſma* is very ſmall, and ſo tranſparent that it cannot eaſily be delineated. It is of a ſingular ſhape; the under part being convex, the upper compreſſed into a kind of keel, and the fore part ſmall.

34. The *forceps* is found about the winter ſolſtice in water covered with lemna. It is of a yellow colour, large, ſomewhat tranſparent, and filled with molecules, with a large opaque globule in the lower part. The fore part is divided into long lobes, one of which is falciform and acute, the other dilated and obliquely truncated. It can open, ſhut, or croſs, thoſe lobes at pleaſure; and by the motion of them it appears to ſuck in the water.

35. The *forfex* is found in river water. It has the fore part formed into a kind of forceps, one of which is twice as long as the other, hooked and ciliated.

36. The *index* is found in ſalt water, and has the under part of the front of the margin hairy; the apex is formed by the fore part projecting like a finger on a direction poſt.

37. The *trichoda* is of a yellow colour, formed of two pellucid membranes ſtriated longitudinally; the lower end obliquely truncated, and the two extremities bent in oppoſite directions.

38. The *navicula* has three corners; the fore part truncated and ciliated, the hind part acute and bent a little upwards. It has a cryſtalline appearance and a kind of longitudinal keel runs down the middle.

39. The *ſucciſa* is of a flattened oval ſhape, the edge hairy, and hollowed out in ſuch a manner as to form two unequal legs.

40. The *ſulcata* is ovated and ventricoſe, the apex acute, with a furrow at the abdomen, and both ſides of it ciliated.

41. The *anas* is found in pure water; and is ſmooth,

five times broader than it is long, filled with darkiſh molecules. It has a bright neck, under the top of which are a few unequal hairs. It moves but languidly.

42. The *barbata* is round, ſomewhat linear, with both ends obtuſe; the fore part narrower, forming as it were a kind of neck, under which is a row of fluctuating hairs. The trunk is full of grey molecules.

43. The *farcimen* is long, round, pellucid, and covered with very minute hairs, and has a great number of mucous veſicles about the body.

44. The *crinita* is long, round, every where ciliated on the upper part, and the under part likewiſe hairy as far as the middle.

45. The *angulus* is long, more convex than moſt of the genus, divided by a kind of articulation in the middle into two parts equal in breadth, but of different lengths; the apex has ſhort waving hair.

46. The *linter* is found in an infuſion of old graſs. It is egg-ſhaped, oblong, with both extremities raiſed ſo that the bottom becomes convex, and the upper part depreſſed like a boat: it is of different ſhapes at different ages, and ſometimes has a rotatory motion.

47. The *paxillus* is found in ſalt water; and is long, full of grey molecules; the fore part truncated and hairy, and rather ſmaller than the other.

48. The *vermicularis* is found in river water; and is pellucid in the fore part, with the hind part full of molecules.

49. The *melitæa* is found in ſalt water, but very rarely. It is oblong, ciliated, with a globular apex, a dilatable neck, and a kind of periſtaltic motion perceivable within it.

50. The *fimbriata* is ſubovated, the apex hairy, the hinder part obliquely truncated and ſerrated.

51. The *camelus* is found but rarely in vegetable infuſions, and moves in a languid manner. The fore part is ventricoſe; the back divided by an inciſion in the middle into two tubercles; the lower part of the belly ſinuated.

52. The *augur* is oblong, depreſſed, pellucid, and filled with molecules: the vertex is truncated, the forepart forming a ſmall beak with three feet underneath; beyond which, toward the hinder part, it is furniſhed with briſtles.

53. The *pupa* is roundiſh, pellucid, and conſiſts of three parts. The head is broad, and appears to be hooded, the top being furniſhed with very ſmall hairs; on the lower part of the head is a tranſparent veſicle, and over the breaſt from the baſe of the head hangs a production reſembling the ſheath of the feet in the pupa of the gnat.

54. The *lunaris* is round and cryſtalline; the hinder part ſmaller than the other. The edge of the back and the part near the tail are bright and clear. It bends itſelf into the form of an arch.

55. The *bilunis* is arched and flattened with an hairy apex, and two little briſtles proceeding from the tail.

56. The *rattus* is oblong, with a kind of keel; the fore part hairy, and a very long briſtle proceeding from the hinder part.

57. The *tigris* reſembles the former, but differs in the form of the tail, which conſiſts of two briſtles, and likewiſe in having a kind of inciſion in the body a little below the apex.

58. The *perillum* is frequently found in marſhes. It is cylindrical, pellucid, muſcular, and capable of being folded up. It appears double; the interior part full of molecules, with an orbicular muſcular appendage, which it can open and ſhut, and which forms the mouth. The external part is membranaceous, pellucid, dilated, and marked with tranſverſe ſtreaks; and it can protrude or draw in the orbicular membrane at pleaſure. Some have four articulations in the tail, others five; and it has two pairs of briſtles, one placed at the ſecond joint, the other at the laſt.

59. The *clavus* has a conſiderable reſemblance to a common nail; the fore part is round and hairy, the hinder part terminating in a ſharp tail.

60. The *cornuta* is membranaceous, elliptical, full of molecules; the fore part lunated, the other round, and terminating in a tail as long as the body.

61. The *gallina* is found in river water. It is of a grey colour, flat, with ſeven large molecules and globules within it; the front obtuſe, ſet with hairs; the hinder part terminating in a tail formed of very fine hairs.

62. The *muſculus* is found in the infuſions of hay which have been kept for ſome months. It is ſmooth, egg-ſhaped, with a double margin drawn underneath it: the fore part narrow, and furniſhed with ſhort hairs which continually play about; having a ſmall tail underneath. It moves ſlowly, and is furniſhed with molecular inteſtines.

63. The *delphis* is found in river water. It is ſmooth, pellucid, having the forepart dilated into a ſemicircle, gradually decreaſing in breadth towards the tail. The front is hairy, the hairs ſtanding as rays from the ſemicircular edge: one of the edges is ſometimes contracted.

64. The *delphinus* is found in hay that has been infuſed for ſome months. It is pellucid, ſmooth, and egg-ſhaped; the hinder part terminating in a tail about half the length of the body, dilated at the upper end, truncated, and always bent upwards. It moves ſometimes on its belly and ſometimes on its ſide.

65. The *clava*, or club trichoda, has the fore part thick, but the hinder part narrow; both extremities obtuſe, pellucid, and replete with molecules; the hind part bent down towards the middle.

66. The *cuniculus* is oblong, the fore part hairy, the hinder part rather acute, and filled with molecules and black veſicles.

67. The *felis* is large and curved, the fore part ſmall, the hinder part gradually diminiſhing into a tail, the under part beſet with hairs longitudinally.

68. The *piſcis* is oblong, the fore part hairy, the hind part terminating in a very ſlender tail. It is ſmooth pellucid, much longer than broad, and filled with yellow molecules; the fore part obtuſe, the hinder part extremely ſlender and tranſparent, the upper ſide convex.

69. The *larus* is long, round, beſet with hairs, and has the tail divided into two points.

70. The *longicauda* is cylindrical; the fore part truncated, and beſet with hairs; the tail long, furniſhed with two briſtles, and having two joints.

71. The *fixa* has the circumference ſet with hairs, and a little ſolitary pedicle projecting from the body.

72. The *inquilinus* is ſheathed within a cylindrical

tranſparent bag, having a little pedicle bent back within the bag.

73. The *ingenita* is ſheathed in a depreſſed bag, broadeſt at the baſe. The animalcule itſelf is funnel-ſhaped, with one or more hairs proceeding from each ſide of the mouth of the funnel. It can extend or contract itſelf within the bag, fixing its tail to the baſe, without touching the ſides. It is found in ſalt water.

74. The *innata* is ſheathed in a cylindrical bag, with a pedicle paſſing through and projecting beyond it.

75. The *tranſfuga* is broad, the fore part hairy, the hinder part full of briſtles; one ſide ſinuated, and the other pointed.

76. The *ciliata* is ventricoſe, the hinder part covered with hair.

77. The *bulla* is membranaceous, the ſides bent inwards; the fore and hind parts both covered with hairs.

78. The *pellionella* is ſomewhat thick in the middle, and pellucid, with a few molecules here and there; the ſides obtuſe, the fore part ciliated with very fine hairs, the hinder part ſet with briſtles.

79. The *cyllidium* has the hinder extremity filled with globules of various ſizes. It vacillates upon the edge, commonly advancing on its flat ſide, and continually drawing in water. It then gapes, and opens into a very acute angle, almoſt to the middle of the body; but this is done ſo inſtantaneouſly, that it can ſcarce be perceived.

80. The *curſor* is oval, the fore part hairy, and the hinder part alſo furniſhed with ſome ſtraight and curved hairs in two faſcicles. Its body is flat, and filled with molecules; and in the fore part is an oblong empty ſpace, into which we may ſometimes ſee the water ſucked in.

81. The *pulex* is egg-ſhaped, with an inciſion in the fore part; the front and baſe hairy.

82. The *lynceus* is nearly ſquare, with a crooked beak and hairy mouth. It is membranaceous, and appears compreſſed, ſtretched out into a beak above, under which there is a little bundle of hairs; the lower edge bends in and out, and is ſurrounded with a few briſtles. The inteſtines are beautiful, and a ſmall bent tube goes from the mouth to them in the middle of the body. There is likewiſe another tube between the fore and hind edge, filled with blue liquor. The inteſtines and other tube are frequently in motion.

83. The *eroſa* is orbicular, the fore part notched; one ſide furniſhed with hairs, the hinder part with briſtles.

84. The *roſtrata* is found in water where duckweed has been kept. It is depreſſed, capable of changing its ſhape, yellow, with long ciliated hairs; it has four feet tapering to a point, one of them longer than the reſt. Both feet and hairs are within the margin. The ſhape of the body is generally triangular; the apex formed into an obtuſe beak, which the creature ſometimes draws in ſo that it appears quite round.

85. The *lagena* is round, ventricoſe, with a long neck, and the lower end ſet with briſtles.

86. The *charon* was found in ſalt water. It is oval, and reſembles a boat as well in its motion as ſhape: the upper part is hollowed, the under part furrowed and convex; the ſtern round, with ſeveral hairs proceeding from it.

87. The *cimex* is about the ſize of the lyncus, has an oval body, with a convex back, flat belly, and inciſion in the margin of the fore part, the edges of which inciſion appear to move. When this animalcule meets with any obſtacles in ſwimming, it makes uſe of four briſtles, which appear on the under ſide as feet.

88. The *cicada* differs but little from the cimex. It is oval, with an obſcure margin, the fore part covered with hairs on the under ſide, and the hinder parts beardleſs.

XIV. *Kerona*

An inviſible worm with horns.

1. The *raſtellum* is found in river water. It has three rows of horns on the back, which occupy almoſt the whole of it.

2. The *lyncaſter* is ſquare, and its diſc furniſhed with ſhining horns.

3. The *hiſtrio* appears an oblong membrane, pellucid, with four or five black points in the fore part, which are continually changing their ſituation, thick ſet with ſmall globules in the middle, among which four larger ones are ſometimes perceived, which by Mr Adams are ſuppoſed to be eggs. In the middle of the hind part are ſome longitudinal ſtrokes reſembling briſtles, which, however, do not ſeem to project beyond the body.

4. The *cypris* is found in water covered with lemna. It is ſomewhat of a pear ſhape, compreſſed, with a broad and blunt fore part; the front furniſhed with hairs or little vibrating points inſerted under the edge, ſhorter in the hind part, partly extended ſtraight, and partly bent down, having a retrograde motion.

5. The *hauſtrum* is orbicular, with the horns in the middle, the fore part membranaceous and ciliated, with ſeveral briſtles at the hinder part.

6. The *hauſtallum* differs from the preceding only in having the hinder part without any briſtles.

7. The *patella* has an univalved ſhell, is orbicular, cryſtalline; the fore part ſomewhat notched; the fleſhy body in the middle of the ſhell; with horns or hairs of different lengths jutting out beyond the ſhell, and acting inſtead of feet and oars, ſome of which are bent; and the ſuperior ones conſtitute a double tranſverſe row.

8. The *vannus* is oval and rather flat, with one edge bent, the oppoſite one ciliated, the front furniſhed with horns, and the hind part with briſtles.

9. The *pullaſter* agrees in many reſpects with the *trichoda pulex;* the upper part is pellucid, without any black molecules; the front truncated, the whole ſurface of the head covered with hair, and the fore part ſinuous.

10. The *mytillus* is a large animalcule; the fore and hind parts rounded, very pellucid and white, dark in the middle, with black inteſtines intermixed with a few pellucid veſicles; both extremities appearing as if compoſed of two thin plates. It has two ſmall horns, with which it agitates the water ſo as to form a little whirlpool.

11. The *lepus* is egg-ſhaped, compreſſed, pellucid,

and crowned with ſhort waving hairs; the baſe terminated with briſtles.

12. The *ſiluris* is an oval, ſmooth, animalcule, ſomewhat crooked and opaque, with a faſcicle of vibrating hair on the fore part: it has a ſharp tail furniſhed with unequal rows of moveable hairs, the back being alſo ciliated: the hairs produce a rotatory motion. The figure varies from oval to oblong, and the filaments of the conferva are often entangled in the tail.

13. The *calvitium* is found in the infuſion of vegetables. The body is broad and flat, both ſides, obtuſe, filled with black molecules, and there is a black ſpot near the hinder part, where there are likewiſe a few ſhort briſtles.

14. The *puſtulata* is found in ſalt water. It is oval, convex; one edge of the hinder part ſinuated, both ends ſet with hairs, and ſome horns on the fore-part.

XV. *Himantopus:*

A pellucid, inviſible, and cirrated worm.

1. The *acarus* is lively, conical, ventricoſe, full of black molecules, with a bright and tranſparent fore part. The lower part of the apex has rows of long hairs on the under part ſet like rays. Four locks of long crooked hair or feet proceed from the belly, and it is continually moving theſe and other hairs in various directions.

2. The *ludio* is a lively diverting animalcule, ſmooth, pellucid, full of ſmall points, the fore part clubbed and a little bent, the hinder part narrow; the baſe obliquely truncated, and terminating in a tail ſtretched out tranſverſely. The top of the head and middle of the back are furniſhed with long and vibrating hairs; three moveable and flexible curls hang down from the ſide of the head at a diſtance from each other. When the creature is at reſt, its tail is curled; but when in motion, it is drawn tight and extended upwards.

3. The *ſannio* is found, though ſeldom, in water where the lemna grows. The cilia are longer than the hairs, and are continually vibrating; it has two moveable curls hanging on the ſide of the head.

4. The *volutator* is ſhaped like a creſcent, and has ſome cryſtalline points; the convex part has a row of hairs longeſt towards the tail, and underneath are four feet. It is very lively, and often turns round with a ſwift circular motion.

5. The *larva* is long and cirrated in the middle; the body is depreſſed and long; the hinder part acute, and generally curved, pellucid, and filled with granular molecules.

6. The *charon* is found in ſea-water, but rarely. It is oval, pellucid, and membranous, with longitudinal furrows, and ſeveral bent diverging rows of hair below the middle, but none on the hinder part.

7. The *corona* is a membranous lamina, very thin, pellucid, cryſtalline, and ſemilunar: the edge of the baſe thick ſet with molecular inteſtines; the fore part furniſhed with a kind of mane; towards the hind part are three equal curved hairs or ſpines.

XVI. *Vorticella:*

A naked worm with rotatory cilia, capable of contracting and extending itſelf.

1. The *viridis* is viſible to the naked eye, appearing like a ſmall green point; but the microſcope diſcovers it to be nearly cylindrical, a little thicker at the fore part than the other, and obtuſe at both ends. It appears to be totally deſtitute of limbs, notwithſtanding which it keeps the water in continual motion; ſo that it probably has ſome inviſible rotatory inſtrument. It moves ſometimes circularly, ſometimes in a ſtraight line.

2. The *ſpheroida* appears alſo like a point; but thro' the microſcope is a globular maſs of a dark green colour. It occaſions a vehement motion in the water, probably by means of ſome ſhort hairs with which it is furniſhed.

3. The *cincta* is of an irregular ſhape, ſometimes aſſuming an oval figure, and appearing as if girt round with a tranſverſe keel. It is inviſible to the naked eye, ciliated on every ſide; the hairs all moveable, and longer on one ſide than the other.

4. The *lunifera* is found in ſalt water; has the fore-part obtuſe, the baſe broad, and hollowed away like a creſcent, with a ſhort protuberance in the middle of the concave part: the fore part is ciliated.

5. The *burſata* is found in ſalt water, and is ventricoſe crammed, with molecules; the fore-part truncated, and both ſides of it pellucid: there is a prominent papilla in the middle, which when the animalcule is at reſt appears notched, the edge of the aperture being ciliated; the hairs are capable of moving in various directions.

6. The *varia* is cylindrical, truncated, opaque, and blackiſh coloured, the fore part ciliated.

7. The *ſputarium* is found in October, with the leſſer lemna, and is one of the moſt ſingular of the microſcopic animalcules. When viewed ſidewiſe, it is ſometimes nearly cylindrical, only tapering a little towards the hinder part, and having a broad pellucid edge. Viewed from the top, it has ſometimes a broad face or diſc, furniſhed with radiating hairs, the under part contracted into a globular ſhape, of a dark green colour, and filled with ſmall grains.

8. The *polymorpha* is viſible to the naked eye, and appears like a green point moving with great agility; but when viewed through a microſcope, it aſſumes ſuch a variety of forms, that it is impoſſible to deſcribe, them. The body is granulous; and a ſeries of pellucid points is ſometimes to be obſerved.

9. The *multiformis* is found in ſalt water, and very much reſembles the former.

10. The *nigra* is found in Auguſt in meadows covered with water. It may be ſeen with the naked eye, appearing like a black point ſwimming on the ſurface. Through the microſcope it appears as a ſmall conical body, obtuſe and ventricoſe at one end, and acute at the other. When the extremities are extended, two ſmall white hooks become viſible, by the aſſiſtance of which it moves in the water, and it probably has a rotatory organ: it moves continually in a vacillating manner on the top of the water.

11. The *cucullus* is likewiſe viſible to the naked eye: it is of a dirty red colour, of a ſhape ſomewhat conical, and reſembling a grenadier's cap.

12. The *utriculata* is green and ventricoſe; the belly capable of being lengthened or ſhortened; the fore part truncated, much in the ſhape of a common water

bottle; the neck is ſometimes very long, ſometimes very ſhort, and filled with green molecules.

13. The *ocreata* is met with in rivers, though very ſeldom, and in ſhape ſomewhat reſembles the lower part of a boot. The apex of the upper part is truncated and ciliated, the heel pointed, and the foot round.

14. The *valga* is as broad as long, and the apex truncated and ciliated; both angles of the baſe projecting outwards, one ſomewhat like a wart, the other like a finger: It is found in marſhy waters.

15. The *papillaris* is likewiſe found in marſhes where the conferva nitida grows. It is ventricoſe; the fore part truncated, with a papillary tail, and a beautiful papillary excreſcence on the ſide.

16. The *ſacculus* is thick, of an equal diameter every where, and full of molecules. The edge of the mouth is bent back; the hinder part is obtuſe, ſometimes notched and contracted, with cilia to be ſeen on both ſides of the mouth.

17. The *cirrata* is found in ditch-water. It is ventricoſe, the aperture ſinuated, and two tufts of hair on each ſide of the belly.

18. The *naſuta* is inviſible to the naked eye, but the microſcope diſcovers it to be furniſhed with a rotatory organ encompaſſing the middle. It is pellucid, cylindrical of an unequal ſize; the fore part truncated and ciliated, with a triangular prominence in the middle of the aperture; the hinder part is obtuſe, with a point on each ſide of the middle of the body. When the water is nearly exhaled, two rotatory organs are obſervable; one on the fore part, and the other encompaſſing the middle of the body; the hairs of the latter being in violent motion. Other faſcicles of moving hair are likewiſe to be obſerved; and the quick and various motions of this apparatus are very ſurpriſing.

19. The *ſtellina* is of an orbicular ſhape, with a molecular diſc and ciliated margin.

20. The *diſcina* is likewiſe orbicular, the edge ciliated, with a kind of handle on the under ſide.

21. The *ſcyphina* is bowl-ſhaped, cryſtalline, with an opaque ſpherule in the middle.

22. The *albina* is cylindrical in the fore part, the hinder part tapering, and almoſt ending in a point.

23. The *fritillina* is empty and cylindrical, with a truncated apex.

24. The *truncatella* is of the larger kind of animalcules with a cryſtalline body, full of black molecules, the ſkin perfectly ſmooth and colourleſs, the hinder extremity rounded, and the anterior part truncated; at this extremity there is a large opening that ſerves for a mouth, which is thickly ciliated.

25. The *limacina* is cylindrical, truncated, and has two pair of cilia.

26. The *fraxinina* is moſtly cylindrical, the hinder part rather tapering, and full of opaque molecules; tranſparent towards the upper end. Within the edge at the top are two ſmall tubercles, from each ſide of which proceeds a pair of ſmall hairs.

27. The *cratægaria* is found in the month of April, both in the mud and on the tail of the monoculus quadricornis. They are generally heaped together in a ſpherical form, and united to one common ſtalk. They are likewiſe often to be found without a pedicle, the body rather contracted, the aperture circular, and ſurrounded with a marked margin. It has two ſmall arms; and with a powerful magnifier a violent rotatory motion may be obſerved. Sometimes an individual will ſeparate from the community, and move in a kind of ſpiral line for a little time, and then go back to the reſt.

28. The *hamata* is not ciliated, nor has it any hairs upon it; the body is granulated, the fore part broad and truncated, the hinder part obtuſe, and capable of being contracted or extended.

29. The *crateriformis* is a lively animalcule, pellucid, round, longer than it is broad, approaching ſomewhat to a ſquare figure, with convex ſides: the head is ſituated at the large end, the ſkin ſmooth, and ſome traces of inteſtines may be diſcovered with difficulty. There is a conſiderable opening ſurrounded by hair at the larger end, and the filaments compoſing it are in continued motion. Two of them are ſometimes ſeen joined together, and full of ſmall ſphericles. In this ſtate they draw each other alternately different ways; the ſurface is ſmooth, and the hairs inviſible.

30. The *canaliculata* appears to the naked eye as a number of white points adhering to the ſides of the glaſs. When magnified, the fore part is narrower than the hind one; in the ſide is a kind of inciſion, and the hinder part is notched towards the middle. It excites a continual whirling motion in the water by means of a rotatory organ with which it is furniſhed.

31. The *verſatilis* is a pellucid, gelatinous animalcule, of a greeniſh colour, and furniſhed with ſmall radii about the circumference; ſo that it appears like a very ſmall water hedge-hog.

32. The *ampula* is contained in a tranſparent bottle-ſhaped bag; the head divided into two lobes. It ſometimes lies at the bottom of the bag, and ſometimes nearly fills the whole of it.

33. The *folliculata* is gelatinous and cylindrical; and when moſt extended, the baſe appears attenuated, and the apex truncated.

34. The *larva* is of a clay colour, the aperture ciliated, with a globular projection at times appearing to proceed from it.

35. The *ſacculata* has the ſhape of an inverted cone, with an aperture in the figure of a creſcent; the lower part of the trunk notched, forming as it were two teeth; the tail biphyllous. Each of theſe is ſurrounded with a looſe bright ſkin, the head being divided from the trunk by a deep inciſion.

36. The *aurita* is cylindrical and ventricoſe, the aperture deſtitute of hairs; both ſides of it are furniſhed with rotatory cicila, and the tail is biphyllous.

37. The *tremula* has ſomething of a conical ſhape; the mouth being divided into parts which are ſet with ſmall ſpines; and a point projects from the tail.

38. The *ſerita* is muſcular, pellucid, folding variouſly, the fore part truncated: round the margin are rows of hairs; but it has alſo ſtiffer hairs or ſpines continually vibrating, with which it draws in all animate and inanimate ſubſtances which it is able to manage.

39. The *lacinulata* is ſhaped like an inverted cone, the aperture lobated, the tail ſmall and furniſhed with two briſtles. When ſwimming, the rotatory organ may be diſcovered. It moves ſwiftly in an oblique direction.

40. The *conſtricta* is of two kinds; *viz.* of a pale yellow and of a white colour. They move by fixing their tail to the place where they are, and then extending their body as much as poſſible; fixing the fore part to the place to which they intend to move, then drawing the hinder part to it, and ſo on. Sometimes they turn round about upon one of the points of their tail; at other times they ſpring forwards with a jerk. When at reſt they open their mouths very wide.

41. The *togata* has a convex body, filled with molecules, and of a dark colour; the hinder part ſomewhat broader than the forepart; the latter ciliated, and the tail formed of two very thin pellucid ſpines, which are ſomewhat curved, and much longer than the body.

42. The *rotatoria* is the *wheel animal* deſcribed by Mr Baker; and of which an account is given under the article Animalcule.

43. The *furcata* is commonly found in water, and has a cylindric body with a rotatory organ, conſiſting of a row of hairs at the apex: the tail is divided into two parts, turning a little inwards. When at reſt it joins the ſegments of the tail, but opens them when in motion.

44. The *catulus* is commonly found in marſhy waters. It is a little thick muſcular animalcule, folding itſelf up: equally broad throughout, the body disfigured by longitudinal folds, winding in various directions. The anterior part is connected to the body by a little neck; and it occaſionally ſhows a ſmall rotatory organ. Its motion is rotatory, but in various directions.

45. The *canicula* is cylindrical, the aperture plain, with a ſhort articulated tail divided into two parts.

46. The *felis* has a large body, the apex of an equal thickneſs, obtuſe, with rotatory filaments: the tail is acute, with two pellucid ſpines in length about one-third part of the body, alternately ſeparating from and approaching one another.

47. The *ſtentorea*. See the article Polype.

48. The *ſocialis*, when conſiderably magnified, appears like a circle ſurrounded with crowns or ciliated heads, tied by ſmall thin tails to a common centre, from whence they advance towards the circumference, where they turn very briſkly, occaſioning a kind of whirlpool, which brings in its food. When one of them has been in motion for a time, it ſtops and another begins; ſometimes two or three may be perceived in motion at once: they are frequently to be met with ſeparate, with the tail ſticking in the mud. The body contracts and dilates very much, ſo as ſometimes to have the appearance of a cudgel, at others to aſſume almoſt a globular form.

49. The *floſculoſa* appears to the naked eye like a yellow globule adhering to the ceratophyllon like a little flower or a heap of yellow eggs. When magnified, they are ſeen to conſiſt of a congeries of animalcula conſtituting a ſphere from a mouldy centre. They contract and extend their bodies either alone or in ſociety, and excite a vortex in the water by means of a diſc. When they quit the ſociety and act ſingly they may be obſerved to conſiſt of a head, abdomen, and tail; the head being frequently drawn back into the abdomen ſo far that it cannot be ſeen, only exhibiting a broad kidney-ſhaped diſc ſtanding out. The abdomen is oblong, oval, and tranſparent; the tail ſharp, twice as long as the abdomen, ſometimes rough and annulated, or altogether ſmooth.

50. The *citrina* is found in ſtagnant water; the head full of molecules, round every where of an equal ſize, and very tranſparent. Both ſides of the orifice are ciliated, and each has a rotatory motion appearing ſometimes without and ſometimes within the edge of the mouth.

51. The *piriformis* is ſomewhat oval, with a very ſmall retractile foot, which it can draw within itſelf.

52. The *tuberoſa* has a broad upper part, the under part ſmall, with two projections at the anterior end, furniſhed with a number of fibrillæ, which produce a current of water by their vibration, and thus collect food for the animal.

53. The *ringens* is pear-ſhaped, pellucid, the middle of the aperture convex, both ſides ciliated, the pedicle four times ſhorter than the body. It can contract the orifice to an obtuſe point.

54. The *inclinans* has a pendulous, pellucid, little head; the anterior part truncated, and occaſionally contracting itſelf twice as ſhort as the pedicle. It is ſhaped like a tobacco-pipe.

55. The *vaginata* is erect, of the ſhape of a truncated egg; the pedicle is contained in a ſheath.

56. The *globularia* is frequent among the cyclopa quadricorni. It has a ſmall ſpherical head, the aperture of the mouth ciliated, the pedicle four times larger than the body, which it contracts into a ſpiral form.

57. The *lunaris* has a ſmall goblet-ſhaped head, the margin of the orifice protuberant, ciliated on both ſides, with undulating hairs, and the pedicle eight or ten times the length of the body. The pedicle extends itſelf as often as the mouth is opened, but is twiſted up ſpirally when it is ſhut; and this is frequently repeated in a ſhort ſpace.

58. The *convallaria* is the ſame with the *bell-animal* mentioned by Mr Baker. See the article Animalcule.

59. The *nutans* has a ſimple pedicle; twiſts itſelf ſpirally; is extremely ſlender, with a kind of cap on its head; the margin white and round, and ſeemingly encompaſſed with a lucid ring; the head diminiſhing towards the baſe.

60. The *nebuliſera* is narrow at the baſe; open and truncated at the top; the margin ſeemingly ſurrounded with a ring: but, when the aperture is ſhut, the animalcule is of the ſhape of an egg, with a ſimple ſetaceous pedicle, conſiderably longer than the body and commonly much bent back.

61. The *annularis* is viſible to the naked eye; the head an inverted cone, convex when the mouth is ſhut, but truncated when it is open; with a protuberant edge; the pedicle ſimple, very long, thick, and, whiter at the top than any where elſe; the apex twiſted ſpirally. When contracted, it appears to be annulated.

62. The *acinoſa* inhabits that whitiſh ſubſtance which often entirely covers plants, wood, ſhells, &c. When this ſubſtance is examined by a microſcope, it appears to be wholly compoſed of living animals of the polype kind. See Polype.

63. The *faſciculata* has a rotatory organ, which may ſometimes be ſeen projecting beyond the aperture; there is a little head at the apex, and the pedicle is twiſted and very ſlender. A congealed green maſs which is often found ſwimming about in ditches is compoſed of myriads of theſe animals, which are not viſible to the naked eye, and when magnified appear like a bundle of green flowers.

64. The *hians* reſembles a citron; the apex is truncated, the baſe narrow, and a gaping cleft is obſervable, deſcending from the apex to one third of the body.

65. The *bellis* is of a yellow colour, and much reſembles the flower of a daiſy; is ciliated round the margin of the head, and moves in a rotatory manner.

66. The *gemella* has a long pedicle, conſtantly furniſhed with two ſmall heads.

68. The *pyraria*.
69. The *anaſtatica*. } See the article Polype.
70. The *digitalis*.

71. The *polypina*, when viewed through a ſmall magnifier, they appear like ſo many little trees: the upper part, or heads, are egg-ſhaped, the top truncated, the lower part filled with inteſtines; the branches thick ſet with little knobs.

72. The *racemoſa* is only diſtinguiſhed from the vorticella ſocialis by always adhering to the ſides of the veſſel in which it is placed. By the microſcope, we diſcover a long pedicle ſticking to the ſides of the veſſels, from which proceed an innumerable quantity of cryſtalline pellucid pearls; which together with the ſtalk, are variouſly agitated in the water. Sometimes they move ſeparately; ſometimes they are drawn down to the root, and in a moment expanded again.

XVII. *Brachionus:*

A contractile worm, covered with a ſhell, and furniſhed with rotatory cilia.

1. The *ſtriatus* has an oblong, pellucid ſhell, capable of altering its figure. The apex is truncated, with ſix ſmall teeth on the edge of it, twelve longitudinal ſtreaks down the back, the baſe obtuſe and ſmooth. The teeth are occaſionally protruded or retracted; and there are two ſmall ſpines or horns on the other ſide of the ſhell. The animal itſelf is of a yellow colour, cryſtalline, and muſcular; now and then putting out from the apex two or three little bundles of playing hairs, the two lateral ones ſhorter than that in the middle: on the under ſide we may obſerve a forked deglutatory muſcle, and two rigid points when the apex is drawn in. It is found in ſea-water.

2. The *ſquamula* has an univalve orbicular ſhell, a truncated apex, four teeth, ſmooth baſe, and no tail.

3. The *pala* is of a yellow colour; univalved, with an oblong excavated ſhell; four long teeth at the apex; a ſmooth baſe.

4. The *bipalium* is univalved, the ſhell oblong and inflected, ten teeth at the apex, the baſe ſmooth and a ſpurious tail.

5. The *patina* is extremely bright and ſplendid, has a large body, a cryſtalline and nearly circular ſhell, without either inciſion or teeth, only towards the apex it falls in ſo as to form a ſmooth notch. A double glittering organ, with ciliated edges, projects from the apex; both of them of a conical figure, and ſtanding as it were upon a pellucid ſubſtance, which is divided into two lobes, between which and the rotatory organ there is a ſilver-coloured crenulated membrane. Two ſmall claws may likewiſe be diſcovered near the mouth.

6. The *clypeatus* is univalved, the ſhell oblong, apex notched, the tail naked, and baſe ſmooth.

7. The *lamellaris* is univalved, the ſhell extending conſiderably beyond the body; the baſe divided into three ſmall horns, with two hairs at the end of the tail.

8. The *patella* is found in marſhy water in the winter-time. It is univalve, the ſhell oval, plain, cryſtalline, with the anterior part terminating in two acute points on both ſides, though the intervening ſpace is commonly filled up with the head of the animal. By theſe points it faſtens itſelf, and whirls about the body erect. The rotatory cilia are perceived with great difficulty.

9. The *bractea* is univalved, the ſhell ſomewhat orbicular, apex lunated, baſe ſmooth, and the tail furniſhed with two ſpines.

10. The *plicatilis* is univalved, with an oblong ſhell the apex hairy, and baſe notched.

11. The *ovalis* is bivalved; the ſhell flattened, apex notched, a hollow part at the baſe, the tail formed of two tufts of hair.

12. The *tripos* is bivalved, the apex of the ſhell beardleſs, three horns at the baſe, and double tail. It fixes itſelf to the objects by the filaments of the tail.

13. The *dentatus* is bivalved, with an arched ſhell; the apex and baſe are both toothed, and the tail formed of two ſpines.

14. The *mucronatus* is bivalved, ſomewhat of a ſquare form; the baſe and apex pointed; the tail conſiſting of two ſpines.

15. The *uncinatus* is one of the ſmalleſt bivalved animalcules; the apex and anterior part round, the hinder part ſtraight terminating in a point, furniſhed with a hook on the fore part, a ſmall rotatory organ, a long tail compoſed of joints, and divided at the end into two briſtles. It can open its ſhell both at the fore and hind part.

16. The *cirratus* is larger than the preceding; ventricoſe, ſomewhat tranſparent, the head conical, with a bundle of hairs on both ſides; and it has likewiſe a rotatory organ.

17. The *paſſus* has a cylindric ſhell, with two long pendulous locks of hair proceeding from the front, the tail conſiſting of a ſingle briſtle.

18. The *quadratus* has a quadrangular ſhell, with two ſmall teeth at the apex, two horns proceeding from the baſe, and no tail.

19. The impreſſus has a quadrangular ſhell, a ſmooth undivided apex; obtuſe baſe; notched margin; and flexuous tail.

20. The *urceolaris*. See Polype.

21. The *brachinus Bakeri* has a ventricoſe ſhell, four teeth at the apex, two horns at the baſe, and a long tail terminating in two ſhort points. The horns are frequently extended; and the circular end of each is furniſhed with a tuft of little hairs, which ſometimes move in a vibratory manner, at other times have a rotatory motion. Mr Muller has alſo diſcovered in this creature two ſmall feelers and a tongue.

22. The *patulus* has a ventricoſe ſhell, with eight

teeth at the apex; the baſe lunated, or hollowed into the form of a creſcent, and furniſhed with four horns; the tail ſhort, with two ſmall points at the end.

THESE are the different kinds of animalcules which have yet been diſcovered. To what is ſaid of them in general under the article ANIMALCULE, we ſhall here add the following obſervations from Mr Adams.—"How many kinds of theſe inviſibles there may be (ſays he), is yet unknown; as they are diſcerned of all ſizes, from thoſe which are barely inviſible to the naked eye, to ſuch as reſiſt the force of the microſcope as the fixed ſtars do that of the teleſcope, and with the greateſt powers hitherto invented appear only as ſo many moving points. The ſmalleſt living creatures our inſtruments can ſhow, are thoſe which inhabit the waters; for though animalcula equally minute may fly in the air, or creep upon the earth, it is ſcarce poſſible to get a view of them; but as water is tranſparent, by confining the creatures within it we can eaſily obſerve them by applying a drop of it to the glaſſes.

"Animalcules in general are obſerved to move in all directions with equal eaſe and rapidity, ſometimes obliquely, ſometimes ſtraight forward; ſometimes moving in a circular direction, or rolling upon one another, running backwards and forwards through the whole extent of the drop, as if diverting themſelves; at other times greedily attacking the little parcels of matter they meet with. Notwithſtanding their extreme minuteneſs, they know how to avoid obſtacles, or to prevent any interference with one another in their motions: ſometimes they will ſuddenly change the direction in which they move, and take an oppoſite one; and, by inclining the glaſs on which the drop of water is, as it can be made to move in any direction, ſo the animalcules appear to move as eaſily againſt the ſtream as with it. When the water begins to evaporate, they flock towards the place where the fluid is, and ſhow a great anxiety and uncommon agitation of the organs with which they draw in the water. Theſe motions grow languid as the water fails, and at laſt ceaſe altogether, without a poſſibility of renewal if they be left dry for a ſhort time. They ſuſtain a great degree of cold as well as inſects, and will periſh in much the ſame degree of heat that deſtroys inſects. Some animalcules are produced in water at the freezing point, and ſome inſects live in ſnow.—By mixing the leaſt drop of urine with the water in which they ſwim, they inſtantly fall into convulſions and die.

"The ſame rule ſeems to hold good in thoſe minute creatures, which is obſervable in the larger animals, *viz*, that the larger kinds are leſs numerous than ſuch as are ſmaller, while the ſmalleſt of all are found in ſuch multitudes, that there ſeem to be myriads for one of the others. They increaſe in ſize, like other animals, from their birth until they have attained their full growth; and when deprived of proper nouriſhment, they in like manner grow thin and periſh."

The modes of propagation among theſe animalcules are various, and the obſervation of them is extremely curious. Some multiply by a tranſverſe diviſion, as is obſerved under the article ANIMALCULE: and it is remarkable, that though in general they avoid one another, it is not uncommon, when one is nearly divided, to ſee another puſh itſelf upon the ſmall neck which joins the two bodies in order to accelerate the ſeparation.—Others, when about to multiply, fix themſelves to the bottom of the water; then becoming firſt oblong, and afterwards round, turn rapidly as on a centre, but perpetually varying the direction of their rotatory motion. In a little time, two lines forming a croſs are perceived; after which the ſpherule divides into four, which grow, and are again divided as before. A third kind multiply by a longitudinal diviſion, which in ſome begins in the fore-part, in others in the hind-part; and from others a ſmall fragment detaches itſelf, which in a ſhort time aſſumes the ſhape of the parent animalcule. Laſtly, others propagate in the ſame manner as the more perfect animals.

In our obſervations under the article ANIMALCULE, we ſuggeſted ſome doubts whether all thoſe minute bodies which go under the name of *animalcules* really do enjoy animal life; or whether they are not in many caſes to be accounted only inanimate and exceedingly minute points of matter actuated by the internal motion of the fluid. This has alſo been the opinion of others: but to all hypotheſes of this kind Mr Adams makes the following reply. "From what has been ſaid, it clearly appears, that their motions are not purely mechanical, but are produced by an internal ſpontaneous principle; and that they muſt therefore be placed among the claſs of living animals, for they poſſeſs the ſtrongeſt marks and the moſt decided characters of animation; and, conſequently, that there is no foundation for the ſuppoſition of a chaotic and neutral kingdom, which can only have derived its origin from a very tranſient and ſuperficial view of theſe animalcules.—It may alſo be further obſerved, that as we ſee that the motions of the limbs, &c. of the larger animals, are produced by the mechanical conſtruction of the body, and the action of the ſoul thereon, and are forced by the ocular demonſtration which ariſes from anatomical diſſection to acknowledge this mechaniſm which is adapted to produce the various motions neceſſary to the animal; and as, when we have recourſe to the microſcope, we find thoſe pieces which had appeared to the naked eye as the primary mechanical cauſes of particular motions, to conſiſt themſelves of leſſer parts, which are the cauſes of motion, extenſion, &c. in the larger; when the ſtructure therefore can be traced no farther by the eye, or by the glaſſes; we have no right to conclude that the parts which are inviſible are not equally the ſubject of mechaniſm: for this would be only to aſſert, in other words, that a thing may exiſt becauſe we ſee and feel it, and have no exiſtence when it is not the object of our ſenſes.—The ſame train of reaſoning may be applied to microſcopic inſects and animalcula: we ſee them move; but becauſe the muſcles and members which occaſion theſe motions are inviſible, ſhall we infer that they have not muſcles, with organs appropriated to the motion of the whole and its parts? To ſay that they exiſt not becauſe we cannot perceive them, would not be a rational concluſion. Our ſenſes are indeed given us that we may comprehend ſome effects; but then we have alſo a mind, with reaſon, beſtowed upon us, that, from the things which we do perceive with our ſenſes, we may deduce the nature of thoſe cauſes and effects which are imperceptible to the corporeal eye.

Leaving theſe ſpeculations however, we ſhall now proceed to give a particular

Explanation of the figures of the various animals, with their parts, ova, &c. repreſented in the plates.

Plate CCCII. Fig. 32. 33. repreſent the eggs of the phalæna neuſtria, as they are taken from the tree to which they adhere, and magnified by the microſcope. The ſtrong ground-work viſible in many places ſhows the gum by which they are faſtened together; and this connection is ſtrengthened by a very tenacious ſubſtance interpoſed between the eggs, and filling up the vacant ſpaces. Fig. 34. ſhows a vertical ſection of the eggs, exhibiting their oval ſhape.—Fig. 35. is an horizontal ſection through the middle of the egg. Theſe eggs make a beautiful appearance through the microſcope. The ſmall figures *a*, *b*, *c*, repreſent the objects in their natural ſtate, without being magnified.

Fig. 36. ſhows the larva of the *muſca chamæleon*, an aquatic inſect. When viewed by the naked eye, it appears (as here repreſented) to be compoſed of twelve annular diviſions, ſeparating it into an head, thorax, and abdomen; but it is not eaſy to diſtinguiſh the two laſt parts from each other, as the inteſtines lie equally both in the thorax and abdomen. The tail is furniſhed with a fine crown or circle of hair *b*, diſpoſed in the form of a ring, and by this means it is ſupported on the ſurface of the water, the head and body hanging down towards the bottom, in which poſture it will ſometimes remain for a conſiderable time without any motion.—When it has a mind to ſink to the bottom, it cloſes the hairs of the ring, as in fig. 37. Thus an hollow ſpace is formed, including a ſmall bubble of air; by enlarging or diminiſhing which, it can riſe or ſink in the water at pleaſure. When the bubble eſcapes, the inſect can replace it from the pulmonary tubes, and ſometimes conſiderable quantities of air may be ſeen to eſcape from the tail of the worm into the common atmoſphere; which operation may eaſily be obſerved when the worm is placed in a glaſs of water, and affords an entertaining ſpectacle. The ſnout of this inſect is divided into three parts, of which that in the middle is immoveable; the other two, which grow from the ſides of the middle one, are moveable, and vibrate like the tongues of lizards or ſerpents. In theſe lateral parts lies moſt of the creature's ſtrength; for it walks upon them when out of the water, appearing to walk on its mouth, and to uſe it as the parrot does its beak to aſſiſt it in climbing.

The larva is ſhown fig. 38. as it appears through a microſcope. It grows narrower towards the head, is largeſt about that part which we may call the thorax, converges all along the abdomen, and terminates at length in a ſharp tail ſurrounded with hairs, as has already been mentioned. The twelve annular diviſions are now extremely viſible, and are marked by numbers in the plate. The ſkin appears ſomewhat hard, and reſembling ſhagreen, being thick ſet with grains pretty equally diſtributed. It has nine holes, or ſpiracula, probably for the purpoſe of breathing, on each ſide; but it has none of theſe on the tail diviſion *a*, nor any eaſily viſible on the third from the head. In the latter, indeed, it has ſome very ſmall holes concealed under the ſkin, near the place where the embryo wings of the future fly are hid. "It is remarkable (ſays Mr Adams) that caterpillars, in general, have two rings without theſe ſpiracula, perhaps becauſe they change into flies with four wings, whereas this worm produces a fly with only two. The ſkin of the larva is adorned with oblong black furrows, ſpots of a light colour, and orbicular rings, from which there generally ſprings a hair; but only thoſe hairs which grow on the inſect's ſides are repreſented in the figure. There are alſo ſome larger hairs here and there, as at *c c*. The difference of colour, however, in this worm ariſes only from the quantity of grains in the ſame ſpace; for where they are in very great numbers, the furrows are darker, and paler where they are leſs plentiful.

The head *d* is divided into three parts, and covered with a ſkin which has hardly any diſcernible grains.—The eyes are rather protuberant, and lie near the ſnout; on which laſt are two ſmall horns at *i i*. It is crooked, and ends in a ſharp point as at *f*. The legs are placed near the ſnout between the ſinuſes in which the eyes are fixed. Each of theſe legs conſiſts of three joints, the outermoſt of which is covered with ſtiff hairs like briſtles *g g*. From the next joint there ſprings a horny bone *h h*, uſed by the inſect as a kind of thumb: the joint is alſo compoſed of a black ſubſtance of an intermediate hardneſs between bone and horn; and the third joint is of the ſame nature. In order to diſtinguiſh theſe parts, thoſe that form the upper ſides of the mouth and eyes muſt be ſeparated by means of a ſmall knife; after which, by the aſſiſtance of the microſcope, we may perceive that the leg is articulated by ſome particular ligaments, with the portion of the inſect's mouth which anſwers to the lower jaw in the human frame. We may then alſo diſcern the muſcles which ſerve to move the legs, and draw them up into a cavity that lies between the ſnout and thoſe parts of the mouth which are near the horns *i i*. The inſect walks upon theſe legs, not only in the water, but on the land alſo. It likewiſe makes uſe of them in ſwimming, keeping its tail on the ſurface contiguous to the air, and hanging downward with the reſt of the body in the water. In this ſituation, the only perceptible motion it has is in its legs, which it moves in a moſt elegant manner, from whence it is reaſonable to conclude, that the moſt of this creature's ſtrength lies in its legs, as we have already obſerved.

The ſnout of this larva is black and hard: the back part quite ſolid, and ſomewhat of a globular form; the front *f* ſharp and hollow. Three membranaceous diviſions may be perceived on the back part; by means of which, and the muſcles contained in the ſnout, the creature can contract or expand it at pleaſure.

The extremity of the tail is ſurrounded with thirty hairs, and the ſides adorned with others that are ſmaller; and here and there the large hairs branch out into ſmaller ones, which may be reckoned ſingle hairs. All theſe have their roots in the outer ſkin, which in this place is covered with rough grains, as may be obſerved by cutting it off and holding it againſt the light upon

Fig. 33 Fig. 32

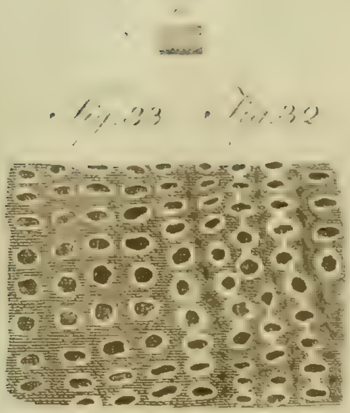


Fig. 38

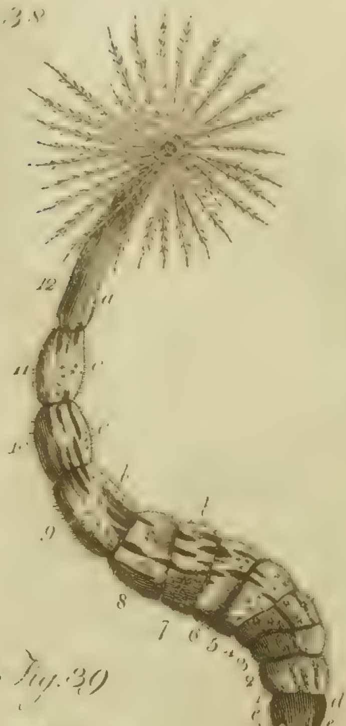


Fig. 35

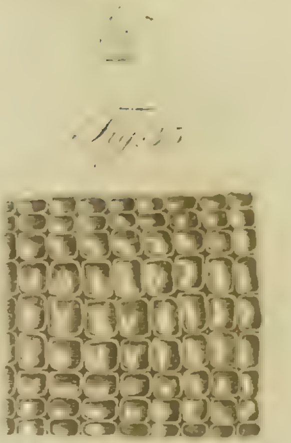


Fig. 36

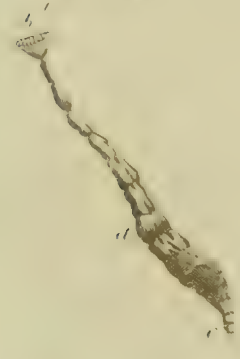


Fig. 37

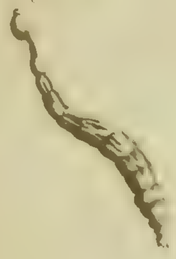


Fig. 39

Fig. 40

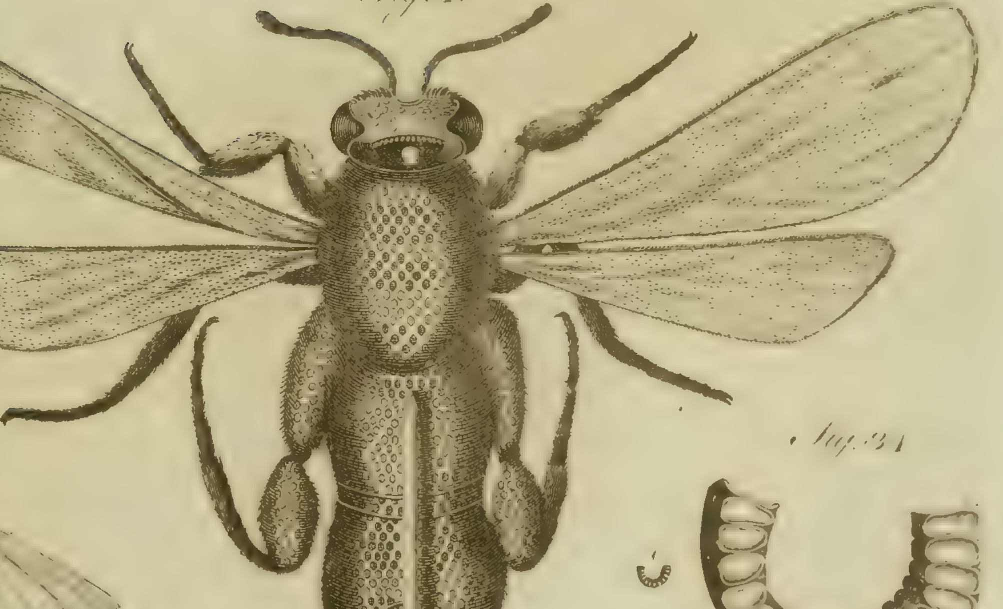


Fig. 41

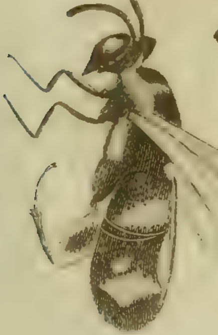
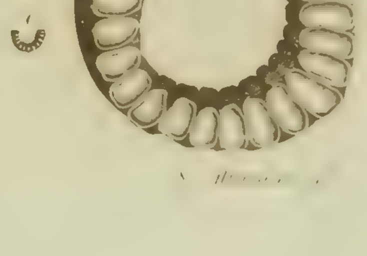


Fig. 34



upon a ſlip of glaſs. Thus alſo we find, that at the extremities of the hairs there are grains like thoſe on the ſkin; and in the middle of the tail there is a ſmall opening, within which are minute holes, by which the inſect takes in and lets out the air it breathes. Theſe hairs, however, are ſeldom diſpoſed in ſuch a regular order as is repreſented in fig. 38. unleſs when the inſect floats with the body in the water, and the tail with its hairs a little lower than the ſurface, in which caſe they are diſpoſed exactly in the order delineated in the plate. The leaſt motion of the tail downward produces a concavity in the water; and it then aſſumes the figure of a wine-glaſs, wide at the top and narrow at the bottom. The tail anſwers the double purpoſe of ſwimming and breathing, and through it the inſect receives what is the principle of life and motion to all animals. By means of theſe hairs alſo it can ſtop its motion when ſwimming, and remain ſuſpended quietly without motion for any length of time. Its motions in ſwimming are very beautiful, eſpecially when it advances with its whole body floating on the ſurface of the water after filling itſelf with air by the tail.—To ſet out, it firſt bends the body to the right or left, and then contracts it in the form of the letter S, and again ſtretches it out in a ſtraight line: by thus contracting and then extending the body alternately, it moves on the ſurface of the water. It is very quiet and is not diſturbed by handling.

Theſe creatures are commonly found in ſhallow ſtanding waters in the beginning of June; but ſome years much more plentifully than others. They crawl on the graſs and other plants which grow in ſuch waters, and are often met with in ditches floating on the ſurface of the water by means of their tail, the head and thorax at the ſame time hanging down; and in this poſture they turn over the clay and dirt with their ſnout and feet in ſearch of food, which is commonly a viſcous matter met with in ſmall ponds and ditches. It is very harmleſs, though its appearance would ſeem to indicate the contrary. It is moſt eaſily killed for diſſection by ſpirit of turpentine.

Fig. 39. ſhows in its natural ſize a beautiful inſect, deſcribed by Linnæus under the name of *Leucopſis dorſigera*, and which appears to be a kind of intermediate genus between a ſphex and a waſp. The antennæ are black and cylindrical, increaſing in thickneſs towards the extremity; the joint neareſt the head is yellow; the head and thorax are black, encompaſſed with a yellow line, and furniſhed with a croſs line of the ſame colour near the head. The ſcutellum is yellow, the abdomen black, with two yellow bands, and a deep ſpot of the ſame colour on each ſide between the bands. A deep poliſhed groove extends down the back from the thorax to the anus, into which the ſting turns and is depoſited, leaving the anus very circular; a yellow line runs on each ſide of the ſting.—The anus and whole body, when viewed with a ſmall magnifier, appear punctuated; but when theſe points are ſeen through a large magnifier, they appear hexagonal. Fig. 40. ſhows the inſect very much magnified. Fig. 41. gives a ſide view of it magnified in a ſmaller degree.

Fig. 42. ſhows an inſect lately diſcovered by Mr John Adams of Edmonton, as he happened to be at an inn. It was firſt ſeen by ſome labouring people who were there at the time, by whom it was conjectured to be a louſe with unuſually long horns, a mite, &c. Mr Adams hearing the debate, procured the inſect; and having viewed it through a microſcope, it preſented the appearance exhibited in fig. 42. The inſect ſeems to be quite diſtinct from the phalangium cancroides of Linnæus. The latter has been deſcribed by ſeveral authors, but none of their deſcriptions agree with this. The abdomen of this inſect is more extended, the claws larger, and much more obtuſe; the body of the other being nearly orbicular, the claws ſlender, and almoſt terminating in a point, more tranſparent, and of a paler colour. Mr Marſham has one in his poſſeſſion not to be diſtinguiſhed from that repreſented in fig. 42, excepting only that it wants the break or dent in the claws, which is ſo conſpicuous in this. He found that inſect firmly fixed by its claws to the thigh of a large fly, which he caught on a flower in Eſſex in the firſt week of Auguſt, and from which he could not diſengage it without great difficulty, and tearing off the leg of the fly. This was done upon a piece of writing paper; and he was ſurpriſed to ſee the little creature ſpring forward a quarter of an inch, and again ſeize the thigh with its claws, ſo that he had great difficulty in diſengaging it. The natural ſize of this creature, which Mr Adams calls the *lobſter-inſect*, is exhibited at *a*.

Plate CCCIII.

Fig. 43. ſhews the inſect named by M. de Geer *Phyſapus*, on account of the bladders at its feet, (*Thrips phyſapus*, Lin.). This inſect is to be found in great plenty upon the flowers of dandelion, &c. in the ſpring and ſummer. It has four wings two upper and two under ones (repreſented fig. 44.) but the two undermoſt are not to be perceived without great difficulty. They are very long; and fixed to the upper part of the breaſt, lying horizontally. Both of them are rather pointed towards the edges, and have a ſtrong nerve running round them, which is ſet with a hair fringe tufted at the extremity. The colour of theſe wings is whitiſh: the body of the inſect is black; the head ſmall, with two large reticular eyes. The antennæ are of an equal ſize throughout, and divided into ſix oval pieces, which are articulated together.—The extremities of the feet are furniſhed with a membranaceous and flexible bladder, which it can throw out or draw in at pleaſure. It preſſes this bladder againſt the ſubſtances on which it walks, and thus ſeems to fix itſelf to them; the bladder ſometimes appears concave towards the bottom, the concavity diminiſhing as it is leſs preſſed. The inſect is repreſented of its natural ſize at *b*.

Fig. 45. repreſents the *Cimex ſtriates* of Linnæus, remarkable for very bright and elegantly diſpoſed colours, though few in number. The head, proboſcis, and thorax, are black: the thorax ornamented with yellow ſpots; the middle one large, and occupying almoſt one-third of the poſterior part; the other two are on each ſide, and triangular. The ſcutellum has two yellow oblong ſpots, pointed at each end. The ground of the elytra is a bright yellow, ſpotted and ſtriped with black. The nerves are yellow; and there is a brilliant triangular ſpot of orange, which unites the cruſtaceous and membranaceous parts; the latter are brown, and clouded. It is found on the elm-tree in June. It is repreſented of its natural ſize at *c*.

Fig. 46. ſhows the *Chryſomela aſparagi* of Linnæus, ſo called from the larva of the inſect feeding upon that plant. It is a common inſect, and very beautiful. It is of an oblong figure, with black antennæ, compoſed of many joints, nearly oval. The head is a deep and bright blue; the thorax red and cylindrical: the elytra are blue, with a yellow margin, and having three ſpots of the ſame colour on each; one at the baſe, of an oblong form, and two united with the margin: the legs are black; but the under ſide of the belly is of the ſame blue colour with the elytra and head. This little animal when viewed by the naked eye, ſcarcely appears to deſerve any notice; but when examined by the microſcope, is one of the moſt pleaſing opaque objects we have. It is found in June on the aſparagus after it has run to ſeed; and is ſhown of its natural ſize at *d*. De Geer ſays that it is very ſcarce in Sweden.

Fig. 47. ſhows an inſect of a ſhape ſo remarkable, that naturaliſts have been at a loſs to determine the genus to which it belongs. In the Fauna Suecica, Linnæus makes it an *attelabus*: but in the laſt edition of the Syſtema Naturæ, it is ranged as a meloe, under the title of the *Meloe monoceros*; though of this alſo there ſeems to be ſome doubt. The true figure of it can only be diſcovered by a very good microſcope. The head is black, and appears to be hid or buried under the thorax, which projects forward like a horn: the antennæ are compoſed of many joints, and are of a dirty yellow colour, as well as the feet: the hinder part of the thorax is reddiſh, the fore part black.—The elytra are yellow, with a black longitudinal line down the ſuture; there is a band of the ſame colour near the apex, and alſo a black point near the baſe, the whole animal being curiouſly covered with hair. The natural ſize of it is ſhown at *e*. It was found in May. Geoffroy ſays that it lives upon umbelliferous plants.

Fig. 48—53. exhibit the anatomy of the coſſus caterpillar, which lives on the willow. The egg from which it proceeds is attached to the trunk of the tree by a kind of viſcous juice which ſoon becomes ſo hard that the rain cannot diſſolve it. The egg itſelf is very ſmall and ſpheroidal, and, when examined by the microſcope, appears to have broad waving furrows running through the whole length of it, which are again croſſed by cloſe ſtreaks, giving it the appearance of a wicker baſket. It is not exactly known what time they are hatched; but as the ſmall caterpillars appear in September, its is probable that the eggs are hatched ſome time in Auguſt. When ſmall, they are generally met with under the bark of the tree to which the eggs were affixed; and an aqueous moiſture, oozing from the hole through which they got under the bark is frequently though not always, a direction for finding them. Theſe caterpillars change their colour but very little, being nearly the ſame when young as when old. Like many others they are capable of ſpinning as ſoon as they come from the egg. They alſo change their ſkin ſeveral times; but as it is almoſt impoſſible to rear them under a glaſs, ſo it is very difficult to know exactly how often this moulting takes place.—Mr Adams conjectures that it is more frequently than the generality of caterpillars do, ſome having been obſerved to change more than nine times.

The coſſus generally faſts for ſome days previous to the moulting; during which time the fleſhy and other interior parts of the head are detached from the old ſkull, and retire as it were within the neck. The new coverings ſoon grow on, but are firſt very ſoft.—When the new ſkin and the other parts are formed, the old ſkin is to be opened, and all the members withdrawn from it; an operation naturally difficult, but which muſt be rendered more ſo from the ſoft and weak ſtate of the creature at that time. It is always much larger after each change,

From Mr Lyonet's experiments, is appears that the coſſus generally paſſes at leaſt two winters, if not three before it aſſumes the pupa ſtate. At the approach of winter, it forms a little caſe, the inſide of which is lined with ſilk, and the outſide covered with wood ground like very fine ſaw-duſt. During the whole ſeaſon it neither moves nor eats,

This caterpillar, at its firſt appearance, is not above one-twelfth of an inch long; but at laſt attains the length of two, and ſometimes of three inches. In the month of May it prepares for the pupa ſtate; the firſt care being to find a hole in the tree ſufficient to allow the moth to iſſue forth and if this cannot be found, it makes one equal in ſize to the future pupa. It then begins to form of wood a caſe or cone; uniting the bits, which are very thin, together by ſilk, into the form of an ellipſoid, the outſide being formed of ſmall bits of wood joined together in all directions; taking care, however, that the pointed end of the caſe may always be oppoſite to the mouth of the hole: having finiſhed the outſide of the caſe, it lines the inſide with a ſilken tapeſtry of a cloſe texture in all its parts, except the pointed end, where the texture is looſer, in order to facilitate its eſcape at the proper time. The caterpillar then places itſelf in ſuch a poſture, that the head may always lie towards the opening of the hole in the tree or pointed end of its caſe. Thus it remains at reſt for ſome time: the colour of the ſkin firſt becomes pale, and afterwards brown; the interior parts of the head are detached from the ſkull; the legs withdraw themſelves from the exterior caſe; the body ſhortens; the poſterior part grows ſmall, while the anterior part ſwells ſo much, that the ſkin at laſt burſts; and, by a variety of motions, is puſhed down to the tail; and thus the pupa is exhibited, in which the parts of the future moth may be eaſily traced.—The covering of the pupa, though at firſt ſoft, humid, and white, ſoon dries and hardens, and becomes of a dark purple colour: the poſterior part is moveable; but not the fore-part, which contains the rudiments of the head, legs, and wings. The fore-part of the pupa is furniſhed with two horns, one above and the other under the eyes. It has alſo ſeveral rows of points on its back. It remains for ſome weeks in the caſe; after which the moth begins to agitate itſelf, and the points are then of eſſential ſervice, by acting as a fulcrum, upon which it may reſt in its endeavours to proceed forward, and not ſlip back by its efforts for that purpoſe.

The moth generally continues its endeavours to open the caſe for a quarter of an hour; after which, by redoubled efforts, it enlarges the hole, and preſſes forward

ward until it arrives at the edge, where it makes a full ſtop, leſt by advancing further it ſhould fall to the ground. After having in this manner repoſed itſelf for ſome time, it begins to diſengage itſelf entirely; and having reſted for ſome hours with its head upwards, it becomes fit for action. Mr Marſham ſays, that it generally puſhes one third of the caſe out of the hole before it halts.

The body of the caterpillar is divided into twelve rings, marked 1, 2, 3, &c. as repreſented in fig. 48. 49. 50. 51. each of which is diſtinguiſhed from that which precedes, and that which follows, by a kind of neck or hollow; and, by forming boundaries to the rings, we make twelve other diviſions, likewiſe expreſſed in the figures; but to the firſt of theſe the word *ring* is affixed, and to the ſecond, *diviſion*. To facilitate the deſcription of this animal, M. Lyonet ſuppoſed a line to paſs down through the middle of the back, which he called the ſuperior line, becauſe it marked the moſt elevated part of the back of the caterpillar; and another, paſſing from the head down the belly to the tail, he called the inferior line.

All caterpillars have a ſmall organ, reſembling an elliptic ſpot, on the right and left of each ring, excepting the ſecond, third, and laſt; and by theſe we are furniſhed with a further ſubdiviſion of this caterpillar, viz. by lines paſſing through the ſpiracula, the one on the right ſide, the other on the left of the caterpillar. Theſe four lines, which divide the caterpillar longitudinally into four equal parts, mark each the place under the ſkin which is occupied by a conſiderable viſcus. Under the ſuperior line lies the heart, or rather thread of hearts; over the inferior line, the ſpinal marrow; and the two tracheal arteries follow the courſe of the lateral lines. At equal diſtances from the ſuperior and two lateral lines, we may ſuppoſe four intermediate lines. The two between the ſuperior and lateral lines are called the intermediate ſuperior; the two others oppoſite to them, and between the lateral and inferior lines, are called the intermediate inferior.

Fig. 48. 49. ſhow the muſcles of the caterpillar, arranged with the moſt wonderful ſymmetry and order, eſpecially when taken off by equal ſtrata on both ſides, which exhibits an aſtoniſhing and exact form and correſpondence in them. The figures ſhow the muſcles of two different caterpillars opened at the belly, and ſuppoſed to be joined together at the ſuperior lines. The muſcles of the back are marked by capitals; the gaſtric muſcles by Roman letters; the lateral ones by Greek characters. Thoſe marked θ are called, by M. Lyonet, dividing muſcles, on account of their ſituation.

The caterpillar was prepared for diſſection by being emptied, and the muſcles, nerves, &c. freed from the fat in the manner formerly directed: after which the following obſervations were made.

The muſcle A in the firſt ring is double; the anterior one being thick at top, and being apparently divided into different muſcles on the upper ſide, but without any appearance of this kind on the under ſide. One inſertion is at the ſkin of the neck towards the head; the other is a little above; and that of the ſecond muſcle A is a little below the firſt ſpiraculum, near which they are fixed to the ſkin.

The muſcle marked α is long and ſlender, fixed by its anterior extremity under the gaſtric muſcles *a* and *b* of the firſt ring, to the circumflex ſcale of the baſe of the lower lip. It communicates with the muſcle *c* of the ſecond ring, after having paſſed under ſome of the arteries, and introduced itſelf below the muſcle θ.

The muſcle β is ſo tender, that it is ſcarce poſſible to open the belly of the caterpillar without breaking it. It is ſometimes double, and ſometimes triple.—Anteriorly it is fixed to the poſterior edge of the ſide of the parietal ſcale, the lower fixture being at the middle of the ring near the inferior line.

There are three muſcles marked ξ; the firſt affixed at one extremity near the lower edge of the upper part of the parietal ſcale; the other end divides itſelf into three or four tails, fixed to the ſkin of the caterpillar under the muſcle δ. The anterior part of the ſecond is fixed near the firſt; the anterior part of the third a little under the firſt and ſecond, at the ſkin of the neck under the muſcle A. Theſe two laſt paſſing over the cavity of the firſt pair of limbs, are fixed by ſeveral tails to the edge oppoſite to this cavity. In this ſubject there are two muſcles marked δ, but ſometimes there is only one anteriorly; they are fixed to the lower edge of the parietal ſcale, the other ends being inſerted in the firſt fold of the ſkin of the neck on the belly-ſide. Fig. 50. beſt repreſents the muſcles β and δ; as in that figure they do not appear injured by any unnatural connection.

In the ſecond and four following rings we diſcern two large dorſal muſcles A and B. In the 7th, 9th, and 10th rings are three, A, B, and C; in the 11th are four, A, B, C, and D; and in the anterior part of the 12th ring are five, A, B, C, D, and E. All theſe ranges of muſcles, however, as well as the gaſtric muſcles *a*, *b*, *c*, *d*, appear at firſt ſight only as a ſingle muſcle, running nearly the whole length of the caterpillar; but when this is detached from the animal, it is found to conſiſt of ſo many diſtinct muſcles, each conſiſting only of the length of one of the rings, their extremities being fixed to the diviſion of each ring, excepting the middle muſcle *a*, which, at the 6th, 7th, 8th, and 9th rings, has its inſertions rather beyond the diviſion. Each row of muſcles appears as one, becauſe they are cloſely connected at top by ſome of the fibres which paſs from one ring to the other.

The muſcles A, which are 12 in number, gradually diminiſh in breadth to the lower part of the laſt ring: at the 8th and three following diviſions they communicate with the muſcles B, and at the 11th with D. In the lower part of the laſt ring, A is much broader than it was in the preceding ring; one extremity of it is contracted, and communicates with B; the lower inſertion being at the membrane I, which is the exterior ſkin of the fecal bag. The muſcles A and B, on the lower part of the laſt ring, cannot be ſeen until a large muſcle is removed, which on one ſide is fixed to the ſubdiviſion of the ring and on the other to the fecal bag.

The right muſcles B, which are alſo 12 in number, begin at the ſecond ring, and grow larger from thence to the ſeventh. They are uſually narrower from thence to the 12th; the deficiency in width being ſupplied by the ſix muſcles C, which accompany it from the 7th to the ſubdiviſion of the 12th ring. The muſcles B and C communicate laterally with the 8th, 11th, and 12th diviſions. C is wanting at the ſubdiviſion of the 12th; its place being here ſupplied by B, which becomes broader at this part.

The firſt of the three floating muſcles V originates at the firſt ring, from whence it introduces itſelf under N, where it is fixed, and then ſubdivides, and hides itſelf under other parts. The ſecond begins at the ſecond diviſion, being fixed to the anterior extremity of B of the ſecond ring; from thence directing itſelf towards the ſtomach; and, after communicating with the caſe of the *corpus craſſum*, it divides, and ſpreads into eight muſcles which run along the belly. The third begins at the third diviſion, originating partly at the ſkin, and partly at the junction of the muſcles B of the ſecond and third ring. It directs itſelf obliquely towards the belly, meeting it near the third ſpiraculum; and branching from thence, it forms the oblique muſcles of ſome of the viſcera.

The thin, long, muſcle θ, which is at the ſubdiviſion of the laſt ring, and covers the anterior inſertion of the muſcle (*a*) where the ring terminates, is ſingle. It begins at one extremity of the muſcle (*c*); at the fore-part of the ring runs along the ſubdiviſion round the belly of the caterpillar, and finiſhes, on the other ſide, at the extremity of a ſimilar muſcle C.

Fig. 49. ſhows the dorſal muſcles of the coſſus. To view which in an advantageous manner, we muſt uſe the following mode of preparation.

1. All the dorſal muſcles, 35 in number, muſt be taken out, as well as the ſeven lateral ones already deſcribed.

2. All the ſtraight muſcles of the belly muſt be taken away, as well as the muſcular roots (*c*), and the ends of the gaſtric muſcles (*c*), which are at the third and fourth diviſions.

3. At the ſecond diviſion the muſcle θ muſt be removed; only the extremities being left to ſhow where it was inſerted.

The parts being thus prepared, we begin at the third ring; where there are found four dorſal muſcles C, D, E, and F. The firſt one C, is inſerted at the third diviſion, under the muſcles θ and α, where it communicates by means of ſome fibres with the muſcle *f* of the ſecond ring; proceeding from thence obliquely towards the intermediate ſuperior line, and is fixed at the fourth diviſion. As ſoon as C is retrenched, the muſcle D is ſeen; which grows wider from the anterior extremity: it lies in a contrary direction to the muſcle C, and is inſerted into the third and fourth diviſions. The muſcle E lies in the ſame direction as the muſcle C, but not ſo obliquely: the lower inſertion is at the fourth diviſion; the other at the third, immediately under C. The muſcle F is nearly parallel to D which joins it; the firſt inſertion is viſible, but the other is hid under the muſcles E and G at the fourth diviſion.

In the eight following rings, there are only two dorſal muſcles; and of theſe D is the only one that is completely ſeen. It is very large, and diminiſhes gradually in breadth from one ring to the other, till it comes to the laſt, ſending off branches in ſome places.---E is one of the ſtrait muſcles of the back; and is inſerted under the dividing muſcles θ, at the diviſions of its own ring.

On the anterior part of the 12th ring there are three dorſal muſcles, D, E, and F. D is ſimilar to that of the preceding ring, marked alſo D, only that it is no more than half the length; terminating at the ſubdiviſion of its own ring. E is of the ſame length, and differs from the muſcle E of the preceding ring only in its direction. F is parallel to E, and ſhorter than it; its anterior end does not reach the twelfth diviſion.

On the poſterior part there is only one dorſal muſcle, faſtened by ſome ſhort ones to the ſubdiviſion of the laſt ring, traverſing the muſcles α; and being fixed there as if deſigned to ſtrengthen them, and to vary their direction.---α is a ſingle muſcle, of which the anterior inſertion is viſible, the other end being fixed to the bottom of the foot of the laſt leg; its uſe is to move the foot. The anterior part of the muſcle β branches into three or four heads, which croſs the ſuperior line obliquely, and are fixed to the ſkin a little above it. The other end is faſtened to the membrane T.

Fig. 50. and 51. ſhow the muſcles of the caterpillar when it is opened at the back. The preparation for this view is to diſengage the fat and other extraneous matter, as before directed.

The firſt ring has only two gaſtric muſcles (*c*) and (*d*): the former is broad, and has three or four little tails: the firſt fixture is at the baſe of the lower lip, from whence it deſcends obliquely, and is fixed between the inferior and lateral line. The ſmall muſcle (*d*) is faſtened on one ſide to the firſt ſpiraculum; on the other, a little lower, to the intermediate inferior and lateral line; and ſeems to be an antagoniſt to the muſcle P, which opens the ſpiracula. The poſterior fixture of δ is under the muſcle C, near the ſkin of the neck: β is fixed a little on the other ſide of C, at the middle of the ring.

In the ſecond ring there are three gaſtric muſcles, *g*, *h*, and *i*: *g* and *h* are fixed at the folds which terminate the ring; but only the anterior part of *i* is fixed there. The muſcle *h* is triple, and in one of the diviſions ſeparated into two parts; that marked *i* comes nearer the inferior line, and is fixed a little beyond the middle of the ring, where the correſponding muſcle of the oppoſite ſide is forked to receive it.

In the third ring, the muſcle *h*, which was triple in the foregoing ring, is only double here, that part which is neareſt the inferior line being broadeſt: it has three tails, of which only two are viſible in the figure. It is exactly ſimilar to that of the preceding ring; and is croſſed in the ſame manner by the muſcle from the oppoſite ſide of the ring.

Throughout the eight following rings, the muſcle *f* which runs through them all is very broad and ſtrong. The anterior part of it is fixed at the intermediate inferior line, on the fold of the firſt diviſion of the ring: the other part is fixed beyond the lower diviſion; with this difference, that at the 10th and 11th rings it is fixed at the laſt fold of its ring; whereas, in the others it paſſes over that ring, and is inſerted into the ſkin of the following one. In all

Microscopic Objects.

Plate CCCIII

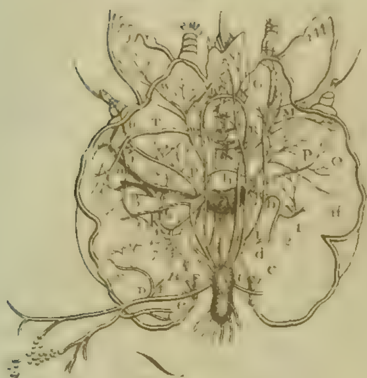


Fig. 54.

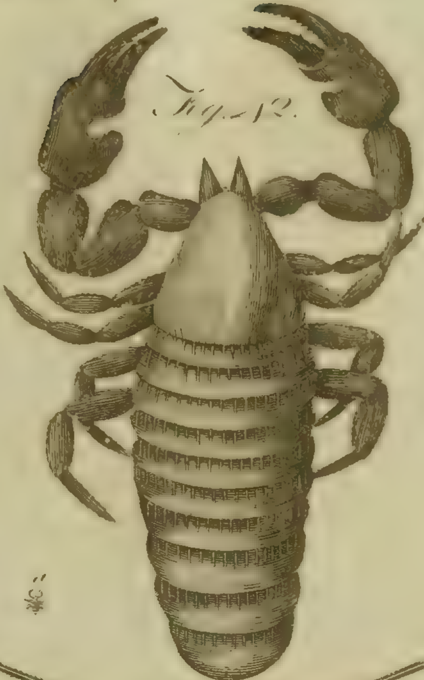


Fig. 42.

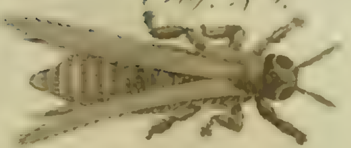


Fig. 45.

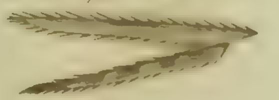


Fig. 44.

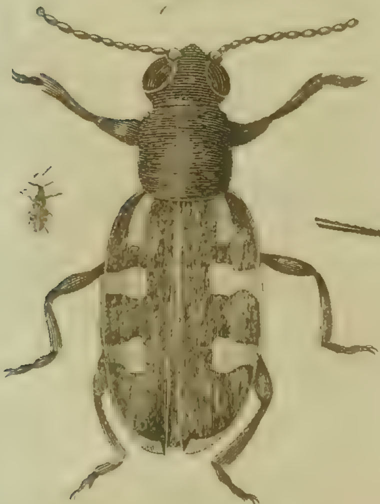


Fig. 46.

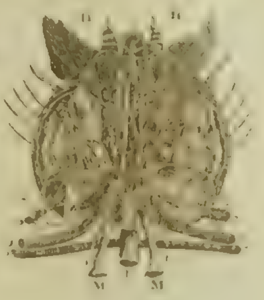


Fig. 53. Fig. 52.

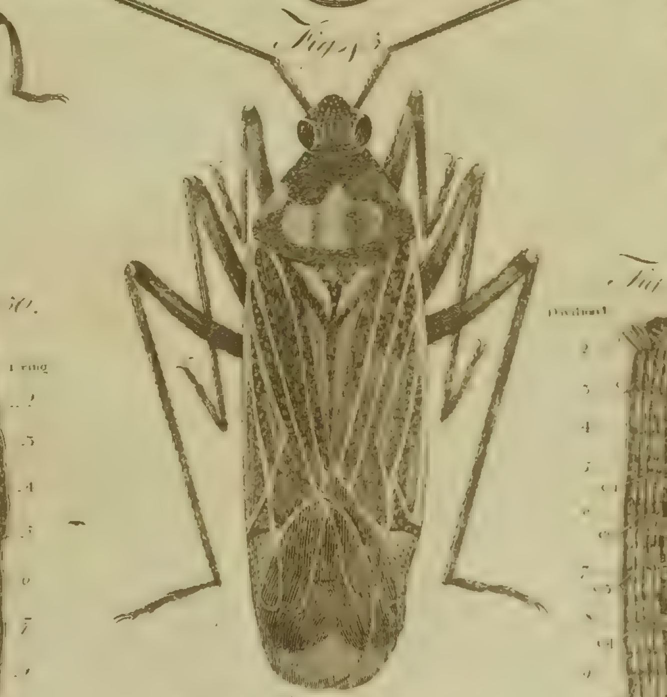


Fig. 43.

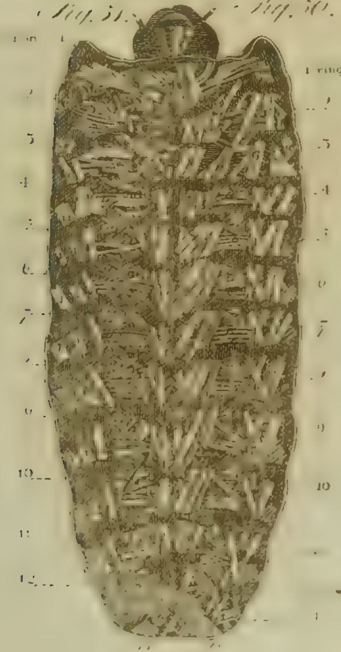


Fig. 51. Fig. 50.

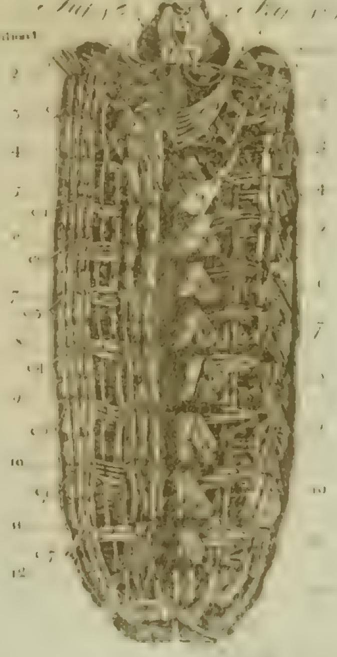


Fig. 48. Fig. 49.

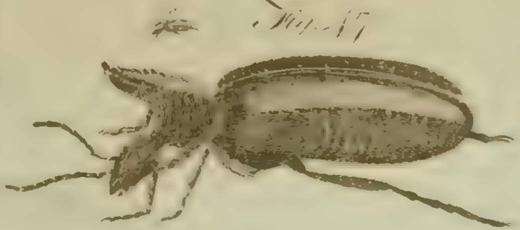


Fig. 47.

theſe, the firſt extremity of the muſcle *g* is faſtened to the fold which ſeparates the ring from the preceding one, and is parallel to *f*, and placed at the ſide of it. The ſix firſt muſcles marked *g*, are forked; that of the fourth ring being more ſo than the reſt, nor does it unite till near its anterior inſertion. The longeſt tail lays hold of the following, and is inſerted near the inferior line; the other inſerts itſelf near the ſame line, at about the middle of its own ring. The two laſt do not branch out; but terminate at the diviſions, without reaching the following ring. The muſcle *h*, placed at the ſide of *f*, has nearly the ſame direction, and finiſhes at the folds of the ring.

The anterior part of the 12th ring has only one gaſtric muſcle, marked *e*: it is placed on the intermediate inferior line; and is inſerted at the folds of the upper diviſion, and at the ſubdiviſion of this ring. The lower part has a larger muſcle marked *c*, with ſeveral diviſions; one placed under *b*, with one extremity fixed near the lateral line, at the ſubdiviſion of its ring; the other to the fecal bag, a little lower than the muſcle *b*.

In fig. 51. all the gaſtric muſcles deſcribed in fig. 50. diſappear, as well as thoſe lateral and dorſal ones of which the letters are not to be found in this figure.

In the firſt ring are the gaſtric muſcles, *e*, *f*, *g*, which are beſt ſeen here: the firſt is narrow and long, paſſing under and croſſing *f*: one of its inſertions is at the lower line, the other at the lateral, between the ſpiraculum and neck: *f* is ſhort, broad, and nearly ſtraight, placed along the intermediate line; but between it and the lateral it paſſes under *e*, and is fixed to the fold of the ſkin which goes from the one bag to the other; the lower inſertion is near the ſecond diviſion. There are ſometimes three muſcles of thoſe marked *g*, and ſometimes four: the lower parts of them are fixed about the middle of the ring, and the anterior parts at the fold of the ſkin near the neck. The muſcles *i* and *h* are fixed to the ſame fold; the other end of *h* being fixed under the muſcle Π, near the ſpiraculum. Above the upper end of *f*, a muſcular body, *g*, may be ſeen. It is formed by the ſeparation of two floating muſcles.

The ſecond ring has ſix gaſtric muſcles, *k*, *l*, *m*, *n*, *o*, *p*. The firſt is a large oblique muſcle, with three or four diviſions placed at the anterior part of the ring: the head is fixed between the inferior line and its intermediate one, at the fold of the ſecond diviſion; from whence it croſſes the inferior line and its correſponding muſcle, terminating to the right and left of the line. I is a narrow muſcle, whoſe head is fixed to the fold of the ſecond diviſion; the tail of it lying under *n*, and faſtened to the edge of the ſkin that forms the cavity for the leg. The two muſcles marked *m* have the ſame obliquity, and are placed the one on the other: the head is inſerted in the ſkin under the muſcle β, and communicates by a number of fibres with the tail of the muſcle χ, the other end is fixed to the intermediate inferior line at the fold of the third diviſion. The large and broad muſcle *n*, covers the lower edge of the cavity of the limb, and the extremity of the tail of *L*. It is fixed firſt at the ſkin, near the intermediate line, from whence it goes in a perpendicular direction towards *m*, and introduces itſelf under *o* and *m*, where it is fixed. The muſcle *o* is narrow and bent, and covers the edge of the cavity of the leg for a little way; one end terminating there, and the other finiſhing at the third diviſion near *m*. That marked *p* is alſo bent: it runs near the anterior edge of the cavity of the leg; one end meets the head of *o*, the other end terminates at a raiſed fold near the inferior line. There is a triangular muſcle on the ſide of the lateral muſcle *o*, ſimilar to that marked *g* in the following ring: in this figure it is entirely concealed by the muſcle *m*.

The third ring has no muſcle ſimilar to *m*; that marked *k* differs only from that of the ſecond ring in being croſſed by the oppoſite muſcle. Thoſe marked *l*, *n*, *o*, *p*, are ſimilar to thoſe of the preceding one. The muſcle *q* is triangular; the baſe is faſtened to the laſt fold of the ring; on the lower ſide it is fixed to the muſcle *o*, the top to the ſkin at the edge of the cavity for the leg.

The eight following rings have the gaſtric muſcles, *i*, *k*, *l*, and *m*. The muſcle *i* is quite ſtraight, and placed at ſome diſtance from the inferior line: it is broad at the fourth ring, but diminiſhes gradually in breadth to the 11th. In the fourth it is united; but divides into two heads, which divaricate in the following rings. In the ſix next rings theſe heads are fixed nearly at the ſame place with *a* and *f*; and in the other two it terminates at the fold of the ring. The anterior inſertion of the firſt and laſt is at the fold where the ring begins: that of the ſix others is ſomewhat lower under the place where the muſcle *i* terminates. The lower part of the oblique muſcle *k* is inſerted in the ſkin near *i*; the upper part at the intermediate inferior muſcle upon the fold which ſeparates the following ring, but is wanting in the 11th. The muſcle *l* is large and co-operates with M: in the opening and ſhutting the ſpiraculum, one of its fixtures is near the intermediate inferior line, at about the ſame height as *i*. The tail terminates a little below the ſpiraculum.

The twelfth ring has only the ſingle gaſtric muſcle *d*, which is a bundle of ſix, ſeven, or eight muſcles: the firſt fixture of theſe is at the ſubdiviſion of the ring near the inferior line: one or two croſs this, and at the ſame time the ſimilar muſcles of the oppoſite ſide. Their fixture is at the bottom of the foot; and their office is to aſſiſt the muſcle *a* in bringing back the foot, and to looſen the claw from what it lays hold of. One of the inſertions of this muſcle *a* is obſerved in this figure near *d*, the other near the ſubdiviſion of the ring.

Fig. 52. and 53. ſhow the organization of the head of the coſſus, though in a very imperfect manner, as M. Lyonet found it neceſſary to employ *twenty* figures to explain it fully. The head is repreſented as it appears when ſeparated from the fat, and diſengaged from the neck. HH are the two palpi. The truncated muſcles D belong to the lower lip, and aſſiſt in moving it. K ſhows the two ganglions of the neck united. II are the two veſſels which aſſiſt in ſpinning the ſilk. L, the œſophagus. M, the two diſſolving veſſels. The Hebrew characters רכבא ſhow the continuation of the four cephalic arteries. In fig. 52. the ten abductor muſcles of the jaw are repreſented by SS, TT, VV, and Z. Four occipital muſcles are ſeen in fig. 53. under *e e* and *f f*. At *a k* is repreſented a nerve of the firſt pair belonging to the ganglion of the neck; *b* is a branch of this nerve.

Fig. 54. exhibits the nerves as ſeen from the under part; but excepting in two or three nerves, which may be eaſily diſtinguiſhed, only one of each pair is drawn, in order to avoid confuſion. The nerves of the firſt ganglion of the neck are marked by capital letters, thoſe of the ganglion (a) of the head by Roman letters; the nerves of the ſmall ganglion by Greek characters. Thoſe of the frontal ganglion, except one, by numbers.

The muſcles of the coſſus have neither the colour nor form of thoſe of larger animals. In their natural ſtate they are ſoft, and of the conſiſtence of a jelly. Their colour is a greyiſh blue, which, with the ſilver-coloured appearance of the pulmonary veſſels, form a glorious ſpectacle. After the caterpillar has been ſoaked for ſome time in ſpirit of wine they loſe their elaſticity and tranſparency, becoming firm, opaque, and white, and the air-veſſels totally diſappear. The number of muſcles in a caterpillar is very great. The greateſt part of the head is compoſed of them, and there is a vaſt number about the œſophagus, inteſtines, &c. the ſkin is, as it were, lined by different beds of them, placed the one under the other, and ranged with great ſymmetry. M. Lyonet has been able to diſtinguiſh 228 in the head, 1647 in the body, and 2066 in the inteſtinal tube, making in all 4041.

At firſt ſight the muſcles might be taken for tendons, as being of the ſame colour, and having nearly the ſame luſtre. They are generally flat and of an equal ſize throughout; the middle ſeldom differing either in colour or ſize from either of the extremities. If they are ſeparated, however, by means of very fine needles, in a drop of ſome fluid, we find them compoſed not only of fibres, membranes, and air-veſſels, but likewiſe of nerves; and, from the drops of oil that may be ſeen floating on the fluid, they appear alſo to be furniſhed with many unctuous particles. Their ends are fixed to the ſkin, but the reſt of the muſcle is generally free and floating. Several of them branch out conſiderably; and the branches ſometimes extend ſo far, that it is not eaſy to diſcover whether they are diſtinct and ſeparate muſcles or parts of another. They are moderately ſtrong; and thoſe which have been ſoaked in ſpirit of wine, when examined by the microſcope are found to be covered with a membrane which may be ſeparated from them; and they appear then to conſiſt of ſeveral parallel bands lying longitudinally along the muſcle, which, when divided by means of fine needles, appear to be compoſed of ſtill ſmaller bundles of fibres lying in the ſame direction; which, when examined by a powerful magnifier, and in a favourable light, appear twiſted like a ſmall cord. The muſcular fibres of the ſpider, which are much larger than thoſe of the caterpillar, conſiſt of two different ſubſtances, one ſoft and the other hard; the latter being twiſted round the former ſpirally, and thus giving it the twiſted appearance juſt mentioned.

There is nothing in the caterpillar ſimilar to the brain in man. We find indeed in the head of this inſect a part from which all the nerves ſeem to proceed; but this part is entirely unprotected, and ſo ſmall, that it does not occupy one fifth part of the head: the ſurface is ſmooth, and has neither lobes nor any anfractuoſity like the human brain. But if we call this a brain in the caterpillar, we muſt ſay that it has *thirteen:* for there are twelve other ſuch parts following each other in a ſtraight line, all of them of the ſame ſubſtance with that in the head, and nearly of the ſame ſize; and from them, as well as from that in the head, the nerves are diſtributed thro' the body.

The ſpinal marrow in the coſſus goes along the belly; is very ſmall, forking out at intervals, nearly of the ſame thickneſs throughout, except at the ganglions, and is not incloſed in any caſe. It is by no means ſo tender as in man; but has a great degree of tenacity, and does not break without a conſiderable degree of tenſion. The ſubſtance of the ganglions differs from that of the ſpinal marrow, as no veſſels can be diſcovered in the latter; but the former are full of very delicate ones. There are 94 principal nerves, which divide into innumerable ramifications.

The coſſus has two large tracheal arteries, creeping under the ſkin cloſe to the ſpiracula; one at the right and the other at the left ſide of the inſect, each of them communicating with the air by means of nine ſpiracula. They are nearly as long as the whole caterpillar; beginning at the firſt ſpiraculum, and extending ſomewhat farther than the laſt; ſome branches alſo extending quite to the extremity of the body. Round each ſpiraculum the trachea puſhes forth a great number of branches, which are again divided into ſmaller ones, and theſe further ſubdivide and ſpread through the whole body of the caterpillar. The tracheal artery, with all its numerous ramifications, are open elaſtic veſſels, which may be preſſed cloſe together, or drawn out conſiderably, but return immediately to their uſual ſize when the tenſion ceaſes. They are naturally of a ſilver colour, and make a beautiful appearance. This veſſel, with its principal branches, is compoſed of three coats, which may be ſeparated from one another. The outmoſt is a thick membrane furniſhed with a great variety of fibres, which deſcribe a vaſt number of circles round it, communicating with each other by numerous ſhoots. The ſecond is very thin and tranſparent, without any particular veſſel being diſtinguiſhable in it. The third is compoſed of ſcaly threads, generally of a ſpiral form; and ſo near each other as ſcarcely to leave any interval. They are curiouſly united with the membrane which occupies the intervals; and form a tube which is always open, notwithſtanding the flexure of the veſſel. There are alſo many other peculiarities in its ſtructure. The principal tracheal veſſels divide into 1326 different branches.

The heart of the coſſus is very different from that of larger animals, being almoſt as long as the animal itſelf. It lies immediately under the ſkin at the top of the back, entering the head, and terminating near the mouth. Towards the laſt rings of the body it is large and capacious, diminiſhing very much as it approaches the head, from the fourth to the twelfth diviſion. On both ſides, at each diviſion, it has an appendage, which partly

Microscopic Objects

Fig. 55

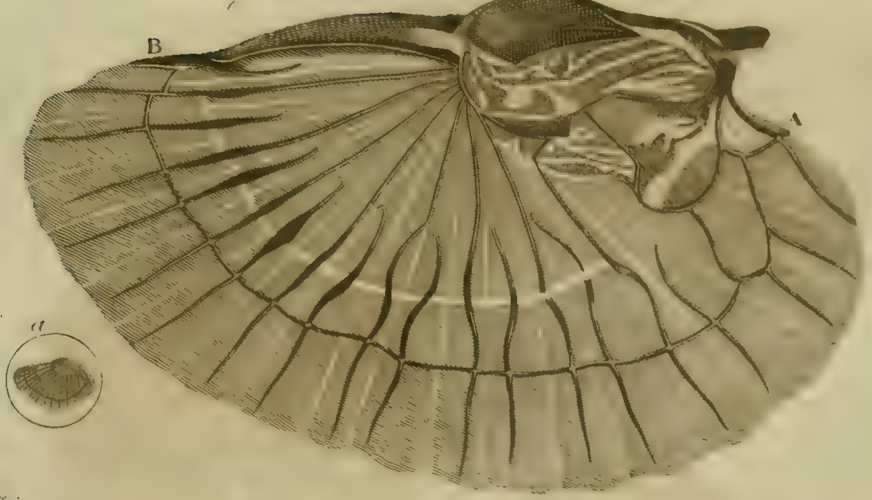


Fig. 58

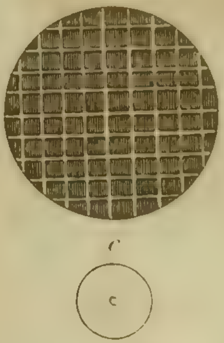


Fig. 57

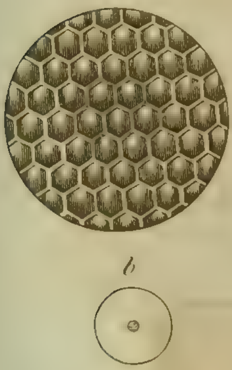


Fig. 59

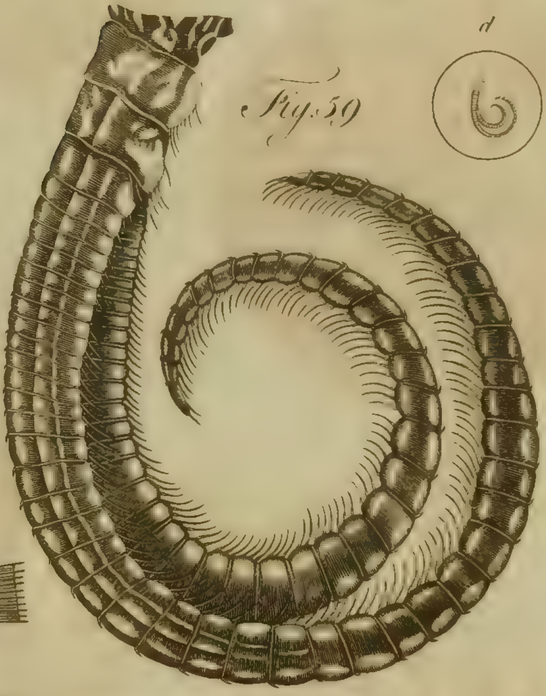
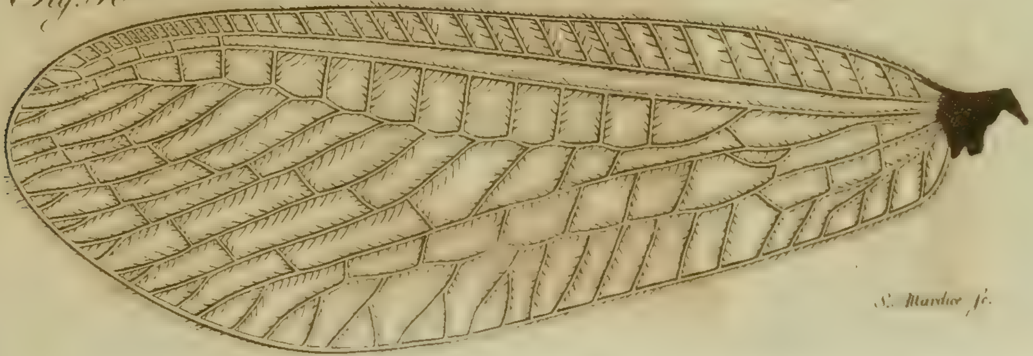


Fig. 56



S. Mardue fc.

Microscopic Objects

Fig. 62

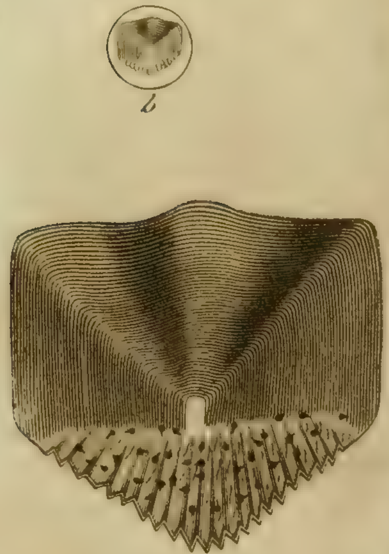


Fig. 65

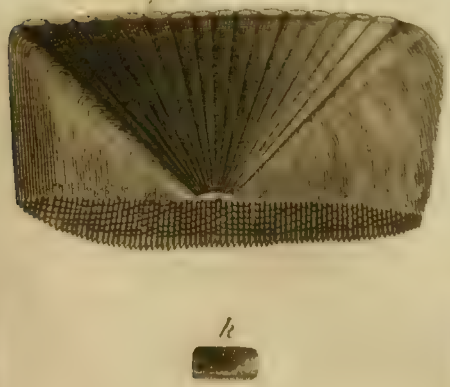


Fig. 64

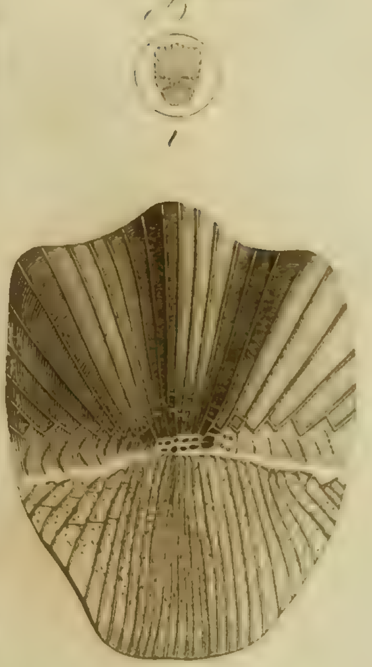


Fig. 61

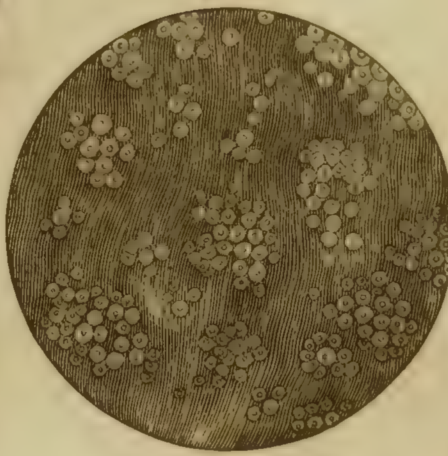


Fig. 63

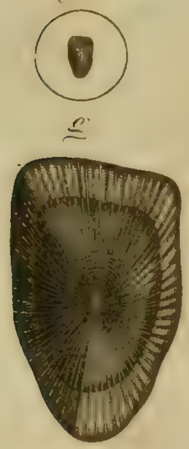


Fig. 66

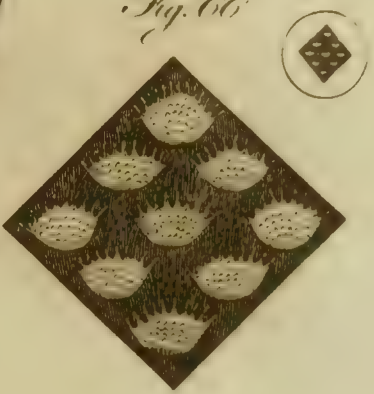
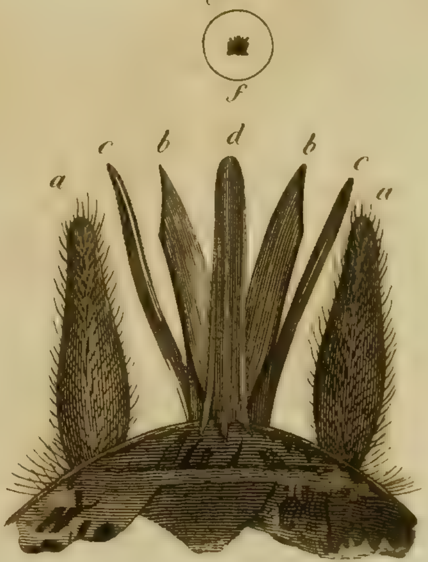
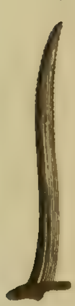


Fig. 60



C



B

D

E

S. Mardlee, fc.

partly covers the muſcles of the back, but which growing narrower as it approaches the lateral line, it forms a number of irregular lozenge-ſhaped bodies.—This tube, however, ſeems to perform none of the functions of the heart in larger animals, as we find no veſſel opening into it which anſwers either to the aorta or vena cava. It is called the heart, becauſe it is generally filled with a kind of lymph, which naturaliſts have ſuppoſed to be the blood of the caterpillar; and becauſe in all caterpillars which have a tranſparent ſkin, we may perceive alternate regular contractions and dilatations along the ſuperior line, beginning at the eleventh ring, and proceeding from ring to ring, from the fourth; whence this veſſel is thought to be a ſtring or row of hearts. There are two white oblong bodies which join the heart near the eighth diviſion; and theſe have been called *reniform* bodies, from their having ſomewhat of the ſhape of a kidney.

The moſt conſiderable part of the whole caterpillar with regard to bulk is the corpus craſſum. It is the firſt and only ſubſtance that is ſeen on opening it. It forms a kind of ſheath which envelopes and covers all the entrails, and introducing itſelf into the head, enters all the muſcles of the body, filling the greateſt part of the empty ſpaces in the caterpillar. It very much reſembles the configuration of the human brain, and is of a milk-white colour.

The œſophagus deſcends from the bottom of the mouth to about the fourth diviſion. The fore-part, which is in the head, is fleſhy, narrow, and fixed by different muſcles to the cruſtaceous parts of it; the lower part which paſſes into the body, is wider, and forms a kind of membranaceous bag, covered with very ſmall muſcles; near the ſtomach it is narrower, and, as it were, confined by a ſtrong nerve fixed to it at diſtant intervals. The ventricle begins a little above the fourth diviſion where the œſophagus ends, and finiſhes at the tenth. It is about ſeven times as long as broad; and the anterior part, which is broadeſt, is generally folded. Theſe folds diminiſh with the bulk as it approaches the inteſtines; the ſurface is covered with a great number of aerial veſſels, and opens into a tube, which M. Lyonet calls the large inteſtine.—There are three of theſe large tubes, each of which differs ſo much from the reſt, as to require a particular name to diſtinguiſh it from them.

The two veſſels from which the coſſus ſpins its ſilk are often above three inches long, and are diſtinguiſhed into three parts; the anterior, intermediate, and poſterior. It has likewiſe two other veſſels, which are ſuppoſed to prepare and contain the liquor for diſſolving the wood on which it feeds.

Plate CCCIV.

Fig. 55 ſhews the wing of an earwig magnified; *a* repreſents it of the natural ſize. The wings of this inſect are ſo artificially folded up under ſhort caſes, that few people imagine they have any. Indeed, they very rarely make uſe of their wings. The caſes under which they are concealed are not more than a ſixth part of the ſize of one wing, though a ſmall part of the wing may be diſcovered, on a careful inſpection, projecting from under them. The upper part of the wing is cruſtaceous and opaque, but the under part is beautifully tranſparent. In putting up their wings, they firſt fold back the parts AB, and then ſhut up the ribs like a fan; the ſtrong muſcles uſed for this purpoſe being ſeen at the upper part of the figure. Some of the ribs are extended from the centre to the outer edge; others only from the edge about half way: but they are all united by a kind of band, at a ſmall but equal diſtance from the edge; the whole evidently contrived to ſtrengthen the wing, and facilitate its various motions. The inſect itſelf differs very little in appearance in its three different ſtates. De Geer aſſerts, that the female hatches eggs like a hen, and broods over her young ones as a hen does.

Fig. 56. repreſents a wing of the *Hemerobius perla* magnified. It is an inſect which ſeldom lives more than two or three days.—The wings are nearly of a length, and exactly ſimilar to one another. They are compoſed of fine delicate nerves, regularly and elegantly diſpoſed as in the figure, beautifully adorned with hairs, and lightly tinged with green. The body is of a fine green colour; and its eyes appear like two burniſhed beads of gold, whence it has obtained the name of *golden eye*. This inſect lays its eggs on the leaves of the plum or the roſe tree; the eggs are of a white colour, and each of them fixed to a little pedicle or foot-ſtalk, by which means they ſtand off a little from the leaf, appearing like the fructification of ſome of the moſſes. The larva proceeding from theſe eggs reſembles that of the coccinella or lady-cow, but is much more handſome. Like that, it feeds upon aphides or pucerons, ſucking their blood, and forming itſelf a caſe with their dried bodies; in which it changes into the pupa ſtate, from whence they afterwards emerge in the form of a fly.

Fig. E, F, I, repreſent the duſt of a moth's wing magnified. This is of different figures in different moths. The natural ſize of theſe ſmall plumes is repreſented at H.

Fig. 57. ſhows a part of the cornea of the libellula magnified. In ſome poſitions of the light, the ſides of the hexagons appear of a fine gold colour, and divided by three parallel lines. The natural ſize of the part magnified is ſhown at *b*.

Fig. 58. ſhows the part *c* of a lobſter's cornea magnified.

Fig. 59. ſhows one of the arms or horns of the lepas antifera, or barnacle, magnified; its natural ſize being repreſented at *d*. Each horn conſiſts of ſeveral joints, and each joint is furniſhed on the concave ſide of the arm with long hairs. When viewed in the microſcope the arms appear rather opaque; but they may be rendered tranſparent, and become a moſt beautiful object, by extracting out of the interior cavity a bundle of longitudinal fibres, which runs the whole length of the arm. Mr Needham thinks that the motion and uſe of theſe arms may illuſtrate the nature of the rotatory motion in the wheel-animal. In the midſt of the arms is an hollow trunk, conſiſting of a jointed hairy tube, which incloſes a long round tongue that can be puſhed occaſionally out of the tube or ſheath, and retracted occaſionally. The mouth of the animal con [illegible] ſix laminæ, which go off with a bend, indented like a ſaw on the convex edge, and by their circular diſpoſition are ſo ranged, that the teeth, in the alternate elevation and depreſſion of each plate, act [illegible] ever comes between them. The [illegible] together in ſuch a manner, that [illegible] form an aperture not much un[illegible] tracted purſe.

Fig. 60. ſhows the ap[illegible]

fly, by which it pierces the ſkin of horſes and oxen, in order to ſuck their blood. The whole is contained in a fleſhy caſe, not expreſſed in the figure. The feelers *a a* are of a ſpongy texture and grey colour, covered with ſhort hairs. They are united to the head by a ſmall joint of the ſame ſubſtance. They defend the other parts of the apparatus, being laid upon it ſide by ſide whenever the animal ſtings, and thus preſerve it from external injury. The wound is made by the two lancets *bb* and B, which are of a delicate ſtructure but very ſharp, formed like the diſſecting knife of an anatomiſt, growing gradually thicker to the back.—The two inſtruments *c c* and C, appear as if intended to enlarge the wound by irritating the parts round it: for which they are jagged or toothed. They may alſo ſerve, from their hard and horny texture, to defend the tube *e* E, which is of a ſofter nature, and tubular, to admit the blood, and convey it to the ſtomach. This part is totally incloſed in a line *d* D, which entirely covers it. Theſe parts are drawn ſeparately at B, C, D, E. De Geer obſerves, that only the females ſuck the blood of animals; and Reaumer informs us, that having made one, that had ſucked its fill, diſgorge itſelf, the blood it threw up appeared to him to be more than the whole body of the inſect could have contained. The natural ſize of this apparatus is ſhown at *f*.

Fig. 61. ſhows a bit of the ſkin of a lump-fiſh *(Cyclopterus)* magnified. When a good ſpecimen of this can be procured, it forms a moſt beautiful object. The tubercles exhibited in the figure probably ſecrete an unctuous juice.

Fig. 62. ſhows the ſcale of a ſea-perch found on the Engliſh coaſt; the natural ſize is exhibited at *h*.

Fig. 63. is the ſcale of an haddock magnified; its natural ſize as within the circle.

Fig. 64. the ſcale of a parrot fiſh from the Weſt Indies magnified; *l* the natural ſize of it.

Fig. 65. the ſcale of a kind of perch in the Weſt Indies magnified; *k* the natural ſize of the ſcale.

Fig. 66. part of the ſkin of a ſole fiſh, as viewed through an opaque microſcope; the magnified part, in its real ſize, ſhown at *l*.

The ſcales of fiſhes afford a great variety of beautiful objects for the microſcope. Some are long; others round, ſquare, &c. varying conſiderably not only in different fiſhes, but even in different parts of the ſame fiſh. Leeuwenhoeck ſuppoſed them to conſiſt of an infinite number of ſmall ſcales or ſtrata, of which thoſe next to the body of the fiſh are the largeſt. When viewed by the microſcope, we find ſome of them ornamented with a prodigious number of concentric flutings too near each other, and too fine to be eaſily enumerated. Theſe flutings are frequently traverſed by others diverging from the centre of the ſcale, and generally proceeding from thence in a ſtraight line to the circumference.

For a more full information concerning theſe and other microſcopical objects, the reader may conſult Mr Adams's *Eſſays on the Microſcope*, who has made the moſt valuable collection that has yet appeared on the ſubject. See alſo the articles Animalcule, Cryſtallization, Polype, Plants, and Wood, in the preſent Work.

MIDAS (fab. hiſt.), a famous king of Phrygia, who having received Bacchus with great magnificence, that god, out of gratitude, offered to grant him whatever he ſhould aſk. Midas deſired that every thing he touched ſhould be changed into gold. Bacchus conſented; and Midas, with extreme pleaſure, every where found the effects of his touch. But he had ſoon reaſon to repent of his folly: for wanting to eat and drink, the aliments no ſooner entered his mouth than they were changed into gold. This obliged him to have recourſe to Bacchus again, to beſeech him to reſtore him to his former ſtate; on which the god ordered him to bathe in the river Pactolus, which from thence forward had golden ſands. Some time after, being choſen judge between Pan and Apollo, he gave another inſtance of his folly and bad taſte, in preferring Pan's muſic to Apollo's; on which the latter being enraged, gave him a pair of aſſes ears. This Midas attempted to conceal from the knowledge of his ſubjects: but one of his ſervants ſaw the length of his ears, and being unable to keep the ſecret, yet afraid to reveal it from apprehenſion of the king's reſentment, he opened a hole in the earth, and after he had whiſpered there that Midas had the ears of an aſs, he covered the place as before, as if he had buried his words in the ground. On that place, as the poets mention, grew a number of reeds, which when agitated by the wind uttered the ſame ſound that had been buried beneath and publiſhed to the world that Midas had the ears of an aſs. Some explain the fable of the ears of Midas, by the ſuppoſition that he kept a number of informers and ſpies, who were continually employed in gathering every ſeditious word that might drop from the mouths of his ſubjects. Midas according to Strabo, died of drinking bull's hot blood. This he did, as Plutarch mentions, to free himſelf from the numerous ill dreams which continually tormented him. Midas, according to ſome, was ſon of Cybele. He built a town which he called *Ancyra*.

Midas, *Ear-ſhell*, the ſmooth ovato-oblong buccinum, with an oblong and very narrow mouth It conſiſts of ſix volutions, but the lower one alone makes up almoſt the whole ſhell.

MID heaven, the point of the ecliptic that culminates, or in which it cuts the meridian.

MIDDLEBURG, one of the Friendly Iſlands in the South Sea. This iſland was firſt diſcovered by Taſman, a Dutch navigator, in January 1742-3; and is called by the natives *Ea-Oo-whe:* it is about 16 miles from north to ſouth, and in the wideſt part about 8 miles from eaſt to weſt. The ſkirts are chiefly laid out in plantations, the ſouth-weſt and north-weſt ſides eſpecially. The interior parts are but little cultivated, though very capable of it; but this neglect adds greatly to the beauty of the iſland; for here are agreeably diſperſed groves of cocoa-nuts and other trees, lawns covered with thick graſs, here and there plantations and paths leading to every part of the iſland, in ſuch beautiful diſorder, as greatly to enliven the proſpect. The hills are low; the air is delightful; but unfortunately water is denied to this charming ſpot. Yams, with other roots, bananas, and bread-fruit, are the principal articles of food; but the latter appeared to be ſcarce. Here is the pepper tree, or *ava-ava*, with which they make an intoxicating liquor, in the ſame diſguſting manner as is practiſed in the Society Iſlands. Here are ſeveral odoriferous trees and ſhrubs, particularly a ſpecies of the lemon tribe; and the botanical gentlemen met with various new ſpecies of plants. Here alſo are a few hogs and fowls.

There are no towns or villages; moſt of the houſes are built in plantations, which are laid out in different parts, with no other order than what convenience requires. They are neatly conſtructed, but are leſs roomy and convenient than thoſe in the Society Iſles. The floors are a little raiſed, and covered with thick ſtrong mats. The ſame ſort of matting ſerves to incloſe them on the windward ſide, the others being open. They have little areas before moſt of them, which are planted round with trees or ornamental ſhrubs, whoſe fragrance perfumes the air. Their houſehold furniture conſiſts of a few wooden platters, cocoa-nut ſhells, and pillows made of wood, and ſhaped like four-footed ſtools or forms: their common clothing, with the addition of a mat, ſerves them for bedding.

The natives are of a clear mahogany or cheſnut brown, with black hair, in ſhort frizzled curls, which ſeems to be burnt at the tips; their beards are cut or ſhaven. The general ſtature of the men is equal to our middle ſize, from five feet three to five feet ten inches; the proportions of the body are very fine, and the *contours* of the limbs extremely elegant, though ſomething more muſcular than at Otaheitee, which may be owing to a greater and more conſtant exertion of ſtrength in their agriculture and domeſtic economy. Their features are extremely mild and pleaſing; and differ from the old Otaheitian faces in being more oblong than round, the noſe ſharper, and the lips rather thinner. The women are, in general, a few inches ſhorter than the men, but not ſo ſmall as the lower claſs of women at the Society Iſlands. The practice of puncturing the ſkin, and blacking it, which is called *tattowing*, is in full force among the men here, for their belly and loins are very ſtrongly marked in configurations more compounded than thoſe at Otaheite. The tendereſt parts of the body were not free from theſe punctures; the application of which, beſides being very painful, muſt be extremely dangerous on glandulous extremities.

The men in general go almoſt naked, having only a ſmall piece of cloth round the loins, but ſome wrapt it in great abundance round them from their waiſt: this cloth is manufactured much like that at Otaheitee, but overſpread with a ſtrong glue, which makes it ſtiff, and fit to reſiſt the wet. The women are likewiſe covered from the waiſt downwards: they often have looſe necklaces, conſiſting of ſeveral ſtrings of ſmall ſhells, ſeeds, teeth of fiſhes; and in the middle of all, the round *operculum*, or cover of a ſhell as large as a crown-piece. The men frequently wear a ſtring round their necks, from which a mother-of-pearl ſhell hangs down on the breaſt; both the ears of the women were perforated with two holes, and a cylinder cut out of tortoiſe-ſhell or bone was ſtruck through both the holes. The moſt remarkable circumſtance obſerved of this people was, that moſt of them wanted the little finger on one, and ſometimes on both hands: the difference of ſex or age did not exempt them from this amputation; for even among the few children that were ſeen running about naked, the greater part had already ſuffered ſuch loſs. This circumſtance was obſerved by Taſman. Another ſingularity which was obſerved to be very general among theſe people, was a round ſpot on each cheek-bone, which appeared to have been burnt or bliſtered. On ſome it ſeemed to have been recently made, on others it was covered with, ſcurf, and many had only a ſlight mark of its former exiſtence: how, or for what purpoſe it was made, could not be learnt. The women here, in general, were reſerved; and turned, with diſguſt, from the immodeſt behaviour of ungovernable ſeamen: there were not, however, wanting ſome who appeared to be of eaſy virtue, and invited their lovers with laſcivious geſtures. The language ſpoken here is ſoft, and not unpleaſing; and whatever they ſaid was ſpoken in a kind of ſinging tone. Omai and Mahine, who were both paſſengers on board the ſhip, at firſt declared that the language was totally new and unintelligible to them; however, the affinity of ſeveral words being pointed out, they ſoon caught the particular modification of this dialect, and converſed much better with the natives than any on board the ſhips could have done, after a long intercourſe. They have the neateſt ornaments imaginable, conſiſting of a number of little flat ſticks, about five inches long, of a yellow wood like box, firmly and elegantly connected together at the bottom by a tiſſue of the fibres of cocoa-nut, ſome of which were of their natural colour, and others dyed black; the ſame fibres were likewiſe uſed in the making of baſkets, the taſte of which was highly elegant, and varied into different forms and patterns. Their clubs are of a great variety of ſhapes, and many of them ſo ponderous as ſcarce to be managed with one hand. The moſt common form was quadrangular, ſo as to make a rhomboid at the broad end, and gradually tapering into a round handle at the other. Far the greater part were carved all over in many chequered patterns, which ſeemed to have required a long ſpace of time, and incredible patience, to work up; as a ſharp ſtone, or a piece of coral, are the only tools made uſe of: the whole ſurface of the plain clubs was as highly poliſhed as if an European workman had made them with the beſt inſtruments. Beſides clubs, they have ſpears of the ſame wood, which were ſometimes plain ſharp-pointed ſticks, and ſometimes barbed with a ſting-ray's tail. They have likewiſe bows and arrows of a peculiar conſtruction: the bow; which is ſix feet long, is about the thickneſs of a little finger, and when ſlack forms a ſlight curve; its convex part is channelled with a ſingle deep groove, in which the bow-ſtring is lodged. The arrow is made of reed, near ſix feet long, and pointed with hard wood: when the bow is to be bent, inſtead of drawing it ſo as to increaſe the natural curvature, they draw it the contrary way, making it perfectly ſtraight, and then form the curve on the other ſide. Moſt of their canoes have outriggers, made of poles, and their workmanſhip is very admirable: two of theſe canoes are joined together with a ſurpriſing exactneſs, and the whole ſurface receives a very curious poliſh. Their paddles have ſhort broad blades, ſomething like thoſe at Otaheitee, but more neatly wrought and of better wood.

They keep their dead above ground, after the manner of the Society iſlands; as a corpſe was ſeen depoſited on a low hut.

Here were ſeen ſeveral men and women afflicted with leprous diſeaſes, in ſome of whom the diſorder had riſen to a high degree of virulence: one man in-particular had his back and ſhoulders covered with a large cancerous ulcer, which was perfectly livid within, and of a bright yellow all round the edges. A woman was likewiſe unfortunate enough to have her face deſtroyed by it in the moſt ſhocking manner; there was only a hole left in the place of her noſe; her cheek was ſwelled up, and continually oozing out a purulent matter; and her eyes ſeemed ready to fall out of her head, being bloody and ſore: though theſe were ſome of the moſt miſerable ojects that could poſſibly be ſeen, yet they ſeemed to to be quite unconcerned about their misfortunes, and traded as briſkly as any of the reſt.

MIDDLELAM, a town in the north-riding of Yorkſhire, ſituated on the river Ure, 255 miles from London. It had once a caſtle, where was born Edward prince of Wales, only ſon of Richard III.; and is noted for a woollen manufactory and frequent horſe-races. Its market is on Monday; and fairs Nov. 6 and 7. The town ſtands on a riſing ground; and the caſtle, which was on the ſouth ſide, was formerly moated round by the help of a ſpring conveyed in pipes from the higher grounds. The church of Middlelam is extra-parochial.

MIDDLESEX, a county of England, which derives its name from its ſituation amidſt the three kingdoms of the Eaſt, Weſt, and South Saxons. It is bounded on the north by Hertfordſhire; on the ſouth by the river Thames, which divides it from Surry; on the weſt by the river Colne, which ſeparates it from Buckinghamſhire; and on the eaſt by the river Lea, which divides it from Eſſex. It extends about 23 miles in length, but hardly 14 in breadth, and is not more than 115 in circumference; but as it comprehends the two vaſt cities of London and Weſtminſter, which are ſituated in the ſouth-eaſt part of the county, it is by far the wealthieſt and moſt populous county in England. It is divided into 602 liberties, containing 200 pariſhes, beſides a vaſt number of chapels of eaſe, and 5 market-towns, excluſive of the cities of London and Weſtminſter. The air is very pleaſant and healthy, to which a fine gravelly ſoil does not a little contribute. The ſoil produces plenty of corn, and the county abounds with fertile meadows and gardeners grounds. In a word, the greater part of the county is ſo prodigiouſly aſſiſted by the rich compoſt from London, that the whole of the cultivated part may be conſidered as a garden. The natural productions are cattle, corn, and fruit; but its manufactures are too many to be enumerated here, there being hardly a ſingle manufacture practiſed in Great Britain but what is alſo eſtabliſhed in this county.—Though London is the chief city, Brentford is the county-town where the members of parliament are elected.

MIDDLETON (Dr Conyers), a very celebrated Engliſh divine, the ſon of a clergyman in Yorkſhire, was born at Richmond in 1683. He diſtinguiſhed himſelf, while fellow of Trinity-college, Cambridge, by his controverſy with Dr Bentley his maſter, relating to ſome mercenary conduct of the latter in that ſtation. He afterwards had a controverſy with the whole body of phyſicians, on the dignity of the medical profeſſion; concerning which he publiſhed *De medicorum apud veteres Romanos degentium conditione diſſertatio; qua, contra viros celeberrimos Jacobum Sponium et Richardum Meadium, ſervilem atque ignobilem eam fuiſſe, oſtenditur:* and in the courſe of this diſpute much reſentment and many pamphlets appeared. Hitherto he had ſtood well with his clerical brethren; but he drew the reſentment of the church on him in 1729, by writing "A letter from Rome, ſhowing an exact conformity between popery and paganiſm," &c.; as this letter, though politely written, yet attacked Popiſh miracles with a gaiety that appeared dangerous to the cauſe of miracles in general. Nor were his Objections to Dr Waterland's manner of vindicating Scripture againſt Tindal's "Chriſtianity as old as the Creation," looked on in a more favourable point of view. In 1741, came out his great work, "The hiſtory of the life of M. Tullius Cicero," 2 vols 4to; which is indeed a fine performance, and will probably be read as long as taſte and polite literature ſubſiſt among us: the author has nevertheleſs fallen into the common error of biographers, who often give panegyrics inſtead of hiſtory. In 1748, he publiſhed, "A free inquiry into the miraculous powers which are ſuppoſed to have ſubſiſted in the Chriſtian church from the earlieſt ages, through ſeveral ſucceſſive centuries." He was now attacked from all quarters; but before he took any notice of his antagoniſts, he ſupplied them with another ſubject in "An examination of the lord biſhop of London's diſcourſes concerning the uſe and extent of prophecy," &c. Thus Dr Middleton continued to diſplay talents and learning, which were highly eſteemed by men of a free turn of mind, but by no means in a method calculated to invite promotion in the clerical line. He was in 1723 choſen principal librarian of the public library at Cambridge; and if he roſe not to dignities in the church, he was in eaſy circumſtances, which permitted him to aſſert a dignity of mind often forgotten in the career of preferment. He died in 1750, at Hilderſham in Cambridgeſhire, an eſtate of his own purchaſing; and in 1752, all his works, except the life of Cicero, were collected in 4 vols, 4to.

MIDDLEWICH, a town of Cheſhire, 167 miles from London. It ſtands near the conflux of the Croke and Dan, where are two ſalt-water ſprings, from which are made great quantities of ſalt, the brine being ſaid to be ſo ſtrong as to produce a full fourth part ſalt. It is an ancient borough, governed by burgeſſes; and its pariſh extends into many adjacent townſhips. It has a ſpacious church. Its market is on Tueſdays; and fairs on St James's-day, July 25. and Holy-Thurſday. By the late inland navigation, it has communication with the rivers Merſey, Dee, Ribble, Ouſe, Trent, Darwent, Severn, Humber, Thames, Avon, &c. which navigation, including its windings extends above 500 miles, in the counties of Lincoln, Nottingham, York, Lancaſter, Weſtmoreland, Stafford, Warwick, Leiceſter, Oxford, Worceſter, &c. The river Wheelock, after a courſe of about 12 miles from Mowcop-hill, runs into the Dan a little above this town.

MIDHURST, a town of Suſſex, 52 miles from London, has been repreſented in parliament ever ſince the 4th of Edward II. It is a neat ſmall town, on a hill ſurrounded with others, having the river Arun at the bottom; and is a borough by preſcription, governed by a bailiff, choſen annually by a jury at a court-leet of the lord of the manor. The market is on Thurſday; fairs on March 21. and the Thurſday after.

MIDIAN, or Madian (anc. geog.), a town on the ſouth ſide of Arabia Petræa; ſo called from one of the ſons of Abraham by Keturah.—Another *Midian*, near the Arnon and Æoplis, in ruins in Jerom's time. With the daughters of theſe Midianites the Iſraelites committed fornication, and were guilty of idolatry. A branch of the Midianites dwelt on the Arabian gulph, and were called *Kenites*; ſome of whom turned proſelytes, and dwelt with the Iſraelites in the land of Canaan.

MID-LOTHIAN. See Lothian.

MIDSHIP-frame, a name given to that timber, or combination of pieces formed into one timber, which determines the extreme breadth of the ſhip, as well as the figure and dimenſion of all the inferior timbers.

In the article *Ship-building*, the reader will find a full explanation of what is meant by a frame of timbers. He will alſo perceive the outlines of all the principal frames, with their gradual dimenſions, from the midſhip-frame delineated in the plane of projection annexed to that article. As the parts of which the ſeveral frames are compoſed have the ſame relation to each other throughout the veſſel, and as all the correſponding pieces, without and within thoſe frames, are alſo nearly alike, and fixed in the ſame manner, it will be here ſufficient for our purpoſe to repreſent the principal or midſhip-frame, together with its correſponding parts, which are as follow:—A, the keel, with *a* the falſe keel beneath it. B, the chocks fixed upon the kelſon, to retain the oppoſite pieces of the *riders* firmly together. C, one of the beams of the orlop. D, one of the lower deck beams; with *d* the beams of the upper deck. E, the hanging-knees, by which the beams are attached to the timbers. F, the ſtandards, which are fixed above the decks to which they belong. G, the clamps, which ſuſtain the extremities of the beams. H, the gun-ports of the lower-deck; with *h* the ports of the upper-deck. I, K, L, different pieces of *thick-ſtuff*, placed oppoſite to the ſeveral ſcarfs or joinings, in the frame of timbers. M, the planks of the deck. N, the water-ways. O, the planks of the ceiling, between the ſeveral ranges of thick-ſtuff. P, the ſpirketing. Q, the main-wale, to fortify the ſhip's ſide oppoſite to the lower deck. R, the channel-wale, oppoſite to the upper deck. S, the waiſt-rail. T, the ſtring, with the moulding under the gun-wale. U, the floor-timbers, which are laid acroſs the keel and bolted to it. V, the ſeveral futtocks; and W the top-timbers, which are all united into one frame. X, the kelſon.

Plate CCCXIII.

MIDSHIPMAN, a ſort of naval cadet, appointed by the captain of a ſhip of war, to ſecond the orders of the ſuperior officers, and aſſiſt in the neceſſary buſineſs of the veſſel, either aboard or aſhore.

The number of midſhipmen, like that of ſeveral other officers, is always in proportion to the ſize of the ſhip to which they belong. Thus a firſt-rate man of war has 24, and the inferior rates a ſuitable number in proportion. No perſon can be appointed lieutenant without having previouſly ſerved two years in the royal navy in this capacity, or in that of *mate*, beſides having been at leaſt four years in actual ſervice at ſea, either in merchant-ſhips or in the royal navy.

Midſhipman is accordingly the ſtation in which a young volunteer is trained in the ſeveral exerciſes neceſſary to attain a ſufficient knowledge of the machinery, movements, and military operations of a ſhip, to qualify him for a ſea-officer.

On his firſt entrance in a ſhip of war, every midſhipman has ſeveral diſadvantageous circumſtances to encounter. Theſe are partly occaſioned by the nature of the ſea-ſervice; and partly by the miſtaken prejudices of people in general reſpecting naval diſcipline, and the genius of ſailors and their officers. No character, in their opinion, is more excellent than that of the common ſailor, whom they generally ſuppoſe to be treated with great ſeverity by his officers, drawing a compariſon between them not very advantegeous to the latter. The midſhipman uſually comes aboard tinctured with theſe prejudices, eſpecially if his education has been amongſt the higher rank of people; and if the officers happen to anſwer his opinion, he conceives an early diſguſt to the ſervice, from a very partial and incompetent view of its operations. Blinded by theſe prepoſſeſſions, he is thrown off his guard, and very ſoon ſurpriſed to find, amongſt thoſe honeſt ſailors, a crew of abandoned miſcreants, ripe for any miſchief or villany. Perhaps, after a little obſervation, many of them will appear to him equally deſtitute of gratitude, ſhame, or juſtice, and only deterred from the commiſſion of any crimes by the terror of ſevere puniſhment. He will diſcover, that the pernicious example of a few of the vileſt in a ſhip of war is too often apt to poiſon the principles of the greateſt number eſpecially if the reins of diſcipline are too much relaxed, ſo as to foſter that idleneſs and diſſipation, which engender ſloth, diſeaſes, and an utter profligacy of manners. If the midſhipman on many occaſions is obliged to mix with theſe, particularly in the exerciſes of extending or reducing the ſails in the tops, he ought reſolutely to guard againſt this contagion, with which the morals of his inferiors may be infected. He ſhould, however, avail himſelf of their knowledge, and acquire their expertneſs in managing and fixing the ſails and rigging, and never ſuffer himſelf to be excelled by an inferior. He will probably find a virtue in almoſt every private ſailor, which is entirely unknown to many of his officers: that virtue is emulation, which is not indeed mentioned amongſt their qualities by the gentleman of *terra firma*, by whom their characters are often copiouſly deſcribed with very little judgement. There is hardly a common tar who is not envious of ſuperior ſkill in his fellows, and jealous on all occaſions to be outdone in what he conſiders as a branch of his duty; nor is he more afraid of the dreadful conſequences of whiſtling in a ſtorm, than of being ſtigmatiſed with the opprobrious epithet of *lubber*. Fortified againſt this ſcandal, by a thorough knowledge of his buſineſs, the ſailor will ſometimes ſneer in private at the execution of orders which to him appear aukward, improper, or unlike a ſeaman. Nay, he will perhaps be malicious enough to ſuppreſs his own judgment, and, by a punctual obedience to command, execute whatever is to be performed in a manner which he knows to be improper, in order to expoſe the perſon commanding to diſgrace and ridicule. Little ſkilled in the method of the ſchools, he conſiders the officer who cons his leſſon by rote as very ill qualified for his ſtation, becauſe particular ſituations might render it neceſſary for the ſaid officer to aſſiſt at putting his own orders in practice. An ignorance in this practical knowledge will therefore neceſſarily be thought an unpardonable deficiency by thoſe who are to follow his directions. Hence the midſhipman who aſſociates with theſe ſailors in the tops, till he has acquired a competent ſkill in the ſervice of extending or reducing the ſails, &c. will be often entertained with a number of ſcurrilous jeſts, at the expence of his ſuperiors. Hence alſo he will learn, that a timely application to thoſe exerciſes can only prevent him from appearing in the ſame deſpicable point of view, which muſt certainly be a cruel mortification to a man of the ſmalleſt ſenſibility.

If the midſhipman is not employed in theſe ſervices, which are undoubtedly neceſſary to give him a clearer idea of the different parts of his occupation, a variety of other objects preſent themſelves to his attention. Without preſuming to dictate the ſtudies which are moſt eſſential to his improvement, we could wiſh to recommend ſuch as are moſt ſuitable to the bent of his inclination. Aſtronomy, geometry, and mechanics, which are in the firſt rank of ſcience, are the materials which form the ſkilful pilot and the ſuperior mariner. The theory of navigation is entirely derived from the two former, and all the machinery and movements of a ſhip are founded upon the latter. The action of the wind upon the ſails, and the reſiſtance of the water at the ſtem, naturally dictate an inquiry into the property of ſolids and fluids; and the ſtate of the ſhip, floating on the water, ſeems to direct his application to the ſtudy of hydroſtatics, and the effects of gravity. A proficiency in theſe branches of ſcience will equally enlarge his views, with regard to the operations of naval war, as directed by the efforts of powder and the knowledge of projectiles. The moſt effectual method to excite his application to thoſe ſtudies, is, perhaps, by looking round the navy, to obſerve the characters of individuals. By this inquiry he will probably diſcover, that the officer who is eminently ſkilled in the ſciences, will command univerſal reſpect and approbation; and that whoever is ſatisfied with the deſpicable ambition of ſhining the hero of an aſſembly, will be the object of univerſal contempt. The attention of the former will be engaged in thoſe ſtudies which are highly uſeful to himſelf in particular, and to the ſervice in general. The employment of the latter is to acquire thoſe ſuperficial accompliſhments that unbend the mind from every uſeful ſcience, emaſculate the judgment, and render the hero infinitely more dexterous at falling into his ſtation in the dance than in the line of battle.

Unleſs the midſhipman has an unconquerable averſion to the acquiſition of thoſe qualifications which are ſo eſſential to his improvement, he will very rarely want opportunities of making a progreſs therein. Every ſtep he advances in thoſe meritorious employments will facilitate his acceſſion to the next in order. If the dunces, who are his officers or meſs-mates, are rattling the dice, roaring bad verſes, hiſſing on the flute, or ſcraping diſcord from the fiddle, his attention to more noble ſtudies will ſweeten the hours of relaxation. He ſhould recollect, that no example from fools ought to influence his conduct, or ſeduce him from that laudable ambition which his honour and advantage are equally concerned to purſue.

MIDWIFE, one whoſe profeſſion is to deliver women in labour. See Midwifery.

MIDWIFERY,

THE art of aſſiſting women in the birth of children. It is ſuppoſed to comprehend alſo the management of women both before and after delivery, as well as the treatment of the child in its moſt early ſtate.

History of Midwifery. The art of midwifery is certainly almoſt coeval with mankind. The firſt *midwife* of whom mention is made under that name, aſſiſted at the ſecond labour of Rachel, the wife of Jacob. Another midwife is ſpoken of in Geneſis, at the lying in of Thamar, who was delivered of twins. But the moſt honourable mention of midwives is that in Exodus, when Pharaoh king of Egypt, who had a mind to deſtroy the Hebrews, commanded the midwives to kill all the male children of the Hebrew women; which command they diſobeyed, and thereby obtained a recompence from God.

From all the paſſages in Scripture where midwives are mentioned, it is plain, that women were the only practitioners of this art among the Hebrews. Among the Greeks alſo women aſſiſted at labours. Phanarete, the mother of Socrates, was a midwife. Plato ſpeaks at large of midwives, explains their functions, regulates their duties, and remarks that they had at Athens the right of propoſing or making marriages. Hippocrates makes mention of midwives, as well as Ariſtotle, Galen, and Aetius. This laſt even frequently quotes a woman called *Aſpaſia*, who was probably a midwife. They were called among the Greeks Μαιαι or Ιατρομαιαι; that is to ſay, *mamma*, or *grand-mamma*.

We are ſtill better acquainted with the cuſtoms of the Romans, and know that they employed women only. This may be deduced from the comedies of Plautus and Terence alone. We there ſee that they are women only who are called to aſſiſt perſons in labour. Beſides, Pliny, in his Natural Hiſtory, frequently ſpeaks of midwives and their duties; and names two, *Sotira* and *Salpe*, who had apparently the greateſt reputation. Women were alſo employed after the fall of the empire; and it is certain, that, till lately, all civilized nations have employed women only as midwives. This appears even from their names in many different languages, which are all feminine. There were, however, eſpecially in great cities, ſurgeons who applied themſelves to the art of midwifery, and made it their particular ſtudy. They were ſent for in difficult caſes, where the midwives found their incapacity; and then the ſurgeon endeavoured to deliver the woman by having recourſe to inſtruments uſeful in thoſe caſes, as by crotchets, crows bills, &c.; but as theſe caſes happened but ſeldom, women remained in poſſeſſion of this buſineſs. It is certain according to Aſtruc, that Maria Thereſia wife of Louis XIV. employed women only in her labours; and the example of the queen determined the conduct of the princeſſes and court-ladies, and likewiſe of the other ladies of the city. The ſame author tells us, that he has been aſſured, that the epoch of the employment of men-midwives goes no farther back than the firſt lying-in of Madam de la Valiere in 1663. As ſhe deſired it might be kept a profound ſecret, ſhe ſent for Julian Clement a ſurgeon of reputation. He was conducted with the greateſt ſecrecy into an houſe where the lady was, with her face covered with a hood; and where it is ſaid the king was concealed in the curtains of the bed. The ſame ſurgeon was employed in the ſubſequent labours of the ſame lady; and as he was very ſucceſsful with her, men-midwives afterwards came into repute, and the princeſſes made uſe of ſurgeons on ſimilar occaſions; and as ſoon as this became faſhionable, the name of *accoucheur* was invented to ſignify this claſs of ſurgeons. Foreign countries ſoon adopted the cuſtom, and likewiſe the name of *accoucheurs*, though they had no ſuch term in their own language; but in Britain they have more generally been called *men-midwives*.

In oppoſition to this account, which is taken from Aſtruc, that author tells us, that he is aware of an objection from Hyginus, who aſſerts, that the ancients had no midwives; which made the women, through modeſty, rather chooſe to run the riſk of death than to make uſe of men on this occaſion. For the Athenians, he adds, had forbid women and ſlaves to ſtudy phyſic, that is to ſay, the art of midwifery. A young woman, named *Agnodice*, deſirous of learning this art, cut off her hair, dreſſed herſelf in the habit of a man, and became a ſcholar to one Hierophilus. She afterwards followed this buſineſs. The women at firſt refuſed aſſiſtance from her, thinking ſhe was a man; but accepted thereof when ſhe had convinced them that ſhe was a woman.

To this account our author replies, that the authority of Hyginus is by no means to be depended upon. His book is full of ſoleciſms and barbariſms; and therefore cannot be attributed to any writer who lived before the fall of the empire; but muſt have been the work of another author who lived when the Latin tongue was corrupted; that is, about the ſeventh or eighth century. The contradictions met with in this book alſo give room to ſuſpect that it is not the work of one hand, but of ſeveral. The authority of ſuch a work, therefore is by no means ſufficient to deſtroy the teſtimonies of thoſe writers who affirm, that among the Greeks the care of lying-in women was committed entirely to others of their own ſex.

The art of midwifery ſeems not to have been ſo ſoon improved as that of phyſic. Hippocrates, though an excellent phyſician, ſeems to have been a very bad midwife. He was acquainted with no other kind of natural labour than that in which the head preſents; and condemns footling labour as fatal both to mother and child: he would have the children in ſuch caſes turned, ſo that the head may preſent. If, ſays he, the arm, or leg, or both, of a living child preſent, they muſt, as ſoon as diſcovered, be returned into the womb, and the child brought into the paſſage with its head downwards. For this purpoſe he adviſes to roll the woman on the bed, to ſhake her and make her jump: he propoſes the ſame expedients to procure the child's delivery: and if they do not ſucceed, he adviſes to extract it with crotchets, and, whatever happens, to diſmember it.

From the time of Hippocrates to that of Celſus, who lived in the reign of the emperor Tiberius, we have no accounts of any improvements in midwifery; but this author gives two very uſeful directions. 1. In dilating the womb; "We muſt (ſays he) introduce the fore-finger, well moiſtened with hog's lard, into the mouth of the womb when it begins to open, and in like manner afterwards a ſecond, and ſo on until all the fingers are introduced, which are then to be uſed by ſeparating them as a kind of dilater, to diſtend the orifice, and facilitate the introduction of the hand which is to act in the womb. 2. Children may be delivered by the feet eaſily and ſafely, without crotchets, by taking hold of their legs. For this purpoſe we muſt take care to turn children, which are otherwiſe placed in the womb with their head or feet downwards." It is true, Celſus ſpeaks of a dead child only; but it was eaſy to conclude from thence, that the ſame practice might be uſed with ſucceſs to deliver a living child. Nevertheleſs, this was not done; and, notwithſtanding the authority of Celſus, the former prejudice continued for a long time. Though Pliny, who lived under the emperors Veſpaſian and Titus, was not a phyſician himſelf, yet by condemning footling labour he atteſts the opinion of the phyſicians of his time. He aſſerts, as a known fact, that footling labour was a preternatural kind of labour; he adds, that children which came into the world in this manner were called *Agrippa*, that is to ſay, born with a great deal of difficulty.

But however common this opinion was, it was never univerſally received; and ſeveral phyſicians of character roſe up, who, without ſuffering themſelves to be dazzled with the common prejudice, or ſeduced by the authority of Hippocrates or Galen, recommended and approved of footling delivery. The queſtion then was a long time undecided; and even in 1657, Riverius, a phyſician of reputation, condemned footling labour. Mauriceau alſo remarks, in the firſt edition of his book on the diſorders of pregnant women, printed in 1664, that many authors were ſtill of opinion, that when the child preſented with its feet, it ſhould be turned to make it come with its head foremoſt; but after having obſerved that it is difficult, if not impoſſible, to execute this, he concludes, "it is much better to extract the child by its feet when they preſent, than to run the hazard of doing worſe by turning it." All practitioners, however, are now of the ſame opinion; and the knowledge of midwifery has been ſo much increaſed within this century, that it ſeems to have nearly attained its ultimate perfection, and its operations reduced almoſt to a geometrical certainty: And this, ſays Aſtruc, is not ſurpriſing; for, after all the art of midwifery is reduced to the following mechanical

chanical problem, “An extenſible cavity of a certain capacity being given, to paſs a flexible body of a given length and thickneſs through an opening dilatable to a certain degree.” This might be reſolved geometrically, if the different degrees of elaſticity of the womb, and ſtrength and weakneſs of the child, the greater or leſſer diſpoſition of the blood to inflammation, and the greater or leſſer degree of irritability of the nerves, did not occaſion that uncertainty which phyſical facts conſtantly produce in all phyſico-mathematical queſtions.

The ſtudy of midwifery in Britain as a ſcience is not of very ancient date. The firſt book publiſhed on the ſubject appeared in the year 1540, and was intitled *The Byrthe of Mankind*, otherwiſe named, *The Woman's Booke*, by Thomas Raynold, phyſition. It underwent a ſecond edition by Thomas Ray, a printer whoſe name is not much known. It was adorned with prints, and went through ſeveral editions, and appears to have been held in high eſtimation. In 1653, the celebrated William Harvey publiſhed his treatiſe on generation; and afterwards engaging in the practice of midwifery, publiſhed his *Exercitatio de partu*. Some notice is alſo taken by Sydenham of the diſeaſes incident to child-bed women, and of thoſe of young children. About this time ſeveral other tracts on ſubjects relating to midwifery appeared, by Wharton, Charleton, Mayow, &c.; but till about the year 1634, Dr Denman conſiders the treatiſe of Raynold already mentioned as being the ſtandard. The appearance of the works of Ambroſe Paré, which were now firſt publiſhed, depreſſed the reputation of Raynold's book; and Dr Chamberlen, a celebrated phyſician, likewiſe applied himſelf about the ſame time to midwifery. He introduced an inſtrument into the art called a *forceps*, but which Dr Denman ſuppoſes to have been a *vectis*.—He had three ſons who likewiſe practiſed midwifery, and, as well as himſelf, obtained conſiderable character; and one of the young men went over to Paris with a view to ſell the ſecret, or advance his fortune by a practice which he had found ſo ſucceſsful in England. In this, however, he was diſappointed; the firſt caſe in which he was engaged proved unſucceſsful, and he ſuffered much reproach in conſequence. Returning to England, therefore, in 1672, he publiſhed a tranſlation of Mauriceau's midwifery, which continued in great eſtimation for many years.

Dr Willoughby, who wrote a treatiſe on midwifery, quoted in manuſcript by Dr Denman, complains of the practice of midwives about this time. He ſays, that the books upon the ſubject all copied one another, recommending methods which could not but be prejudicial to the woman; and that particularly they did not attend to the efforts of nature, but endeavoured to force the birth before the proper time. He was the grandſon of Sir Francis Willoughby, ſo much celebrated in the time of queen Elizabeth; and Dr Denman is of opinion, that the ſame and fortune acquired by Dr Chamberlen, induced ſo many gentlemen as now practiſed midwifery to undertake the ſtudy of it, and to make uſe of inſtruments as he did. Among theſe was Dr Bamber; but others attempted to raiſe their reputation by a quite contrary practice. In 1723, Dr Maubray publiſhed a book on midwifery, intitled, *The Female Phyſician, or the Whole Art of New improved Midwifery*, in which he violently declaims againſt the uſe of inſtruments; and next year he publiſhed an appendix, under the title of *Midwifery brought to perfection*, in which he ſets forth in a pompous manner the improvements he had made. This, however, was no more than a ſyllabus of his lectures, he having been the firſt public teacher of midwifery in Britain.

Dionis's midwifery made its appearance in 1719, and Deventer's in 1729. The latter, in Dr Denman's opinion, was more eſteemed than it deſerved, as he generally condemns the uſe of inſtruments; notwithſtanding which, he thinks it a conſiderable acquiſition to the ſcience in this country.

In 1727 appeared Dr Simſon's work, intitled, *The Syſtem of the Womb*; “a work (ſays Dr Denman) of ſufficient ingenuity, but not of much uſe in practice, even if his theory had been true.” Chapman's *Treatiſe on the Improvement of Midwifery* appeared in 1733. He was the ſecond public teacher of midwifery in London, and was the firſt who deſcribed the *forceps*; the deſcription appearing in the third volume of the Edinburgh Medical Eſſays. His work contains many uſeful obſervations. Next year Dr Hody publiſhed a collection of caſes in midwifery, written by Mr William Giffard. They are 275 in number, occurred in his own practice, and appear to be written with great fidelity. He alſo gave a plate of the forceps; and, in Dr Denman's opinion, was among the firſt who aſſerted that the placenta might be attached over the *os uteri*. In 1736, Thomas Dawke publiſhed a book, intitled, *The Midwife rightly Inſtructed*; and, the following year, *The Midwife's Companion*, By Henry Bracken: but theſe, as well as ſome others which made their appearance about the ſame time, are of no importance.

About the ſame time alſo, Sir Richard Manningham quitted the profeſſion of pharmacy, and applied to the ſtudy and practice of midwifery. He had received the honour of knighthood in 1730; and in 1739 he eſtabliſhed a ſmall hoſpital or ward for lying-in women, which was the firſt thing of the kind in the Britiſh dominions. Here alſo he gave lectures; and at the ſame time qualified his ſtudents for practice. He became very eminent in his profeſſion, which he exerciſed with great humanity, and was accounted a man of great learning. He publiſhed a work, intitled *Compendium Artis Obſtetricæ*; and another, called *Aphoriſmata Medica*, relating alſo chiefly to the art of midwifery. In 1741, Sir Fielding Oulde of Dublin publiſhed *A Treatiſe of Midwifery*; the moſt important parts of which are ſome obſervations on the continuance of the thickneſs of the uterus during pregnancy, with his deſcription of the manner in which the head of the child paſſes through the pelvis at the time of the birth; the truth of which obſervations have ſince been univerſally ackowledged.

From this time the Engliſh, according to Dr Denman ‡, might be ſaid “to have been in full poſſeſſion of the ſubject; all the books written in the neigbouring countries being tranſlated, public lectures given, and an hoſpital eſtabliſhed for the further improvement of the art: and as all the books printed ſince that time may readily be procured, every gentleman has an opportunity of forming his own opinion of their reſpective merits. But the college of phyſicians (adds he), having been pleaſed, in the year 1783, to form a rank in which thoſe who dedicate themſelves to the ſtudy of midwifery ſhould be placed, I truſt that future accounts will be more correct; and that this meaſure adopted by the college will promote the public benefit, by confining the induſtry and abilities of one claſs of men to this branch of the profeſſion."

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‡ Introduction to the Practice of Midwifery, preface.

In Scotland, though there has for a long time been profeſſors of midwifery, yet the ſurgeons likewiſe practiſe that art as well as their own. Several approved treatiſes on the ſubject have appeared in this country; particularly a ſyſtem by the late Dr Smellie, which has been long held in the higheſt eſtimation in both kingdoms; and within theſe few years, ſeveral excellent performances by Dr Alexander Hamilton of the univerſity of Edinburgh: And indeed, we may venture to affirm, that both theory and practice of midwifery are as well underſtood in this kingdom as in any part of the world.

PART I. THEORY OF MIDWIFERY.

Deſcription of the Pelvis in general.

Deſcription of the Pelvis in general.

THE ſubject of this Part comprehends, in a particular manner, the anatomical ſtructure of the pelvis, and other parts concerned in the formation of the child, the theories of conception, generation, &c. of the nutrition, growth of the fœtus, and of the powers by which it is expelled. Of all theſe ſome account has been given under other articles; but as the particular deſcription of the pelvis belongs peculiarly to this ſubject, we ſhall here give an account of its various conformations, as they in a great meaſure affect women at the time of child-bearing, and very particularly contribute to the eaſe or difficulty of the labour.

CHAP. I. *Deſcription of the Pelvis in general.*

Dr DENMAN obſerves, that the term *pelvis* has been applied indiſcriminately to the inferior cavity of the abdomen, and to the bones which form that cavity; but he thinks it moſt proper to confine it to the bones, and to diſtinguiſh the hollow by the name of the cavity of the pelvis. In the ſtate of infancy, the pelvis is compoſed of five or ſix bones, moſt of which in the fœtus are ſoft and flexible; ſome of them being, in a manner, quite cartilaginous; while the edges of others are found covered with a ſubſtance of the ſame kind. This conſtruction is thought by ſome to facilitate delivery, as the pelvis of the fœtus can thus change its figure like the cranium; but M. Baudelocque thinks this an erroneous opinion, "conſonant neither to reaſon nor experience."

In the adult the pelvis conſiſts only of four bones, viz. the *ſacrum*, the *os coccygis*, and the two *oſſa innominata*. Theſe being already deſcribed under the article ANATOMY, we ſhall here content ourſelves with obſerving, that an anchyloſis is not unfrequently formed between the os ſacrum and the oſſa innominata; and ſometimes an imperfect joint in conſequence of their ſeparation; whence the part is very much weakened, and the perſon ever afterwards walks with difficulty.

The os coccygis in infancy is cartilaginous; but in the adult it is compoſed of three, or more frequently of four bones, connected by intermediate cartilages, the uppermoſt of which is ſomewhat broader than the lower part of the os ſacrum. In ſome ſubjects theſe bones coaleſce, and form a ſingle one: in others an anchyloſis is formed between the ſacrum and os coccygis; in conſequence of which the latter is ſhortened and turned inwards, ſo as to obſtruct the head of the child in its paſſage through the pelvis. But the impediment thereby occaſioned at the time of labour may be overcome by the force with which the head of the child is propelled, and the os coccygis again ſeparated from the ſacrum with a noiſe loud enough to be diſtinctly heard. In general, however, ſome regreſſive motion is preſerved between the bones of which the os coccygis is compoſed; and that which is produced between the *ſacrum* and *os coccygis*, when the latter is preſſed by the head of a child paſſing through the pelvis, occaſions a conſiderable temporary enlargement of the inferior aperture of the pelvis. Any lateral motion is prevented by the inſertion of the *coccygæi* muſcles, part of the *levatores ani*, and ſome portions of the ſacro-ſciatic ligaments into the ſides of the *os coccygis*.

The *os innominatum*, in a woman of the ordinary ſize, is about ſix inches broad from the anterior to the poſterior ſuperior ſpine. The height is nearly ſix inches and an half from the anterior ſpine to the bottom of the tuberoſity of the iſchium, and ſeven and an half if taken from the middle of the criſta of the ilium; and hence we may in ſome meaſure be enabled to determine the depth of the cavity of the pelvis laterally from the ſuperior to the inferior ſtrait.

"The oſſa pubis (ſays M. Baudelocque †) are joined together by means of a ſubſtance which has always been deſcribed by the name of cartilage, though it differs as much from that as from a ligament. According to ſome anatomiſts, each *os pubis* is covered by its own cartilage. Their junction not a true ſynchondroſis; but a cloſe articulation, which admits only of inſenſible motions. By carefully examining this ſymphyſis, we obſerve that each os pubis is really covered by a cartilage at its anterior extremity; that this cartilage is thicker before than behind, and in its ſuperior and inferior parts than in the middle of its length; that theſe bones, thus covered, are bound together by means of a ſubſtance which ſeems ligamentous, and whoſe fibres, which are moſtly tranſverſe, go from one to the other; that theſe fibres are ſo diſpoſed, that the deepeſt are the ſhorteſt, and the moſt ſuperficial the longeſt; that they leave between one another a kind of meſhes filled with reddiſh corpuſcles, very like thoſe which are ſeen about the moveable articulations, and which are commonly thought to be ſynovial glands. We obſerve farther, that this fibrous and ligamentous ſubſtance does not occupy the whole thickneſs of the ſymphyſis, and does not bind the bones together through the whole extent of the ſurfaces preſented by their anterior extremities; but that there exiſts a true articulation of the ſpecies known by the name of *arthrodia*. If we open this ſymphyſis towards the inſide of the pelvis, after a cellular tiſſue very thin and looſe, which we meet with firſt, we diſcover a capſular membrane, whoſe moſt apparent fibres are tranſverſal; afterwards

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† Syſtem of Midwifery tranſlated by Mr Heath.

Deſcription of the Pelvis in general.

towards two cartilaginous facettes, ſmooth, poliſhed, and moiſt, from ſix to eight lines long and two bread, of a figure a little ſemilunar, lightly convex on one bone and concave on the other. Theſe facettes comprehend nearly the middle third of the length of the ſymphyſis and the poſterior third of its thickneſs.—This ſymphyſis then preſents in one third of its extent, or thereabouts, a true articulation; and in the reſt a *ſynneuroſis* and *ſynchondroſis* at the ſame time.

"This compound and articular ſubſtance, being detached from the bones, forms a kind of wedge, whoſe baſe conſtitutes the anterior part of the ſymphyſis, and its edge the poſterior; ſo that theſe bones ſeem to touch towards the inſide of the pelvis, and appear ſeparated to the diſtance of ſeveral lines without: The baſe of this kind of wedge is generally from four to ſix lines bread towards the middle of the length of the ſymphyſis, and from eight to ten in the inferior and ſuperior parts, while the edge at moſt does not exceed one line. Its thickneſs, taken according to that of the bones, is greater above than below; where this ſubſtance, become thinner, forms what is called the triangular ligament.

"This firſt means of union was not ſufficient to give theſe bones the firmneſs neceſſary for the free exerciſe of the functions to which the pelvis is deſtined. It is covered and fortified in all parts, but eſpecially before, by bundles of ligamentous and aponeurotic fibres. Independently of the thick and very ſtrong ligamentous ſtructure which forms the fore-part of the ſymphyſis, we obſerve bundles of tendinous fibres which decuſſate each other a thouſand ways, ſome of which ariſe from the interior *graciles* and the external *obturators*, and others from the external portions of the inguinal rings. The triangular expanſion which terminates the ſymphyſis inferiorly, and which forms the top of the arch of the pubes, ſeems to have other uſes than that of binding the bones together.

"The manner in which the *os ſacrum* is connected with the *oſſa innominnata*, differs conſiderably from that in which the *oſſa pubis* are joined. Here each articular facette is covered by a true cartilaginous layer, and there are inequalities on each ſide, which mutually receive one another, while nothing of that kind is obſerved in the junction of the pubes; neither are there in any part of theſe articular facettes any of the tranſverſe fibres which go from one bone to the other in the *oſſa pubis*: theſe articulations, therefore, derive all their ſtrength from the great numbers of ligaments which ſurround them. Moſt of theſe are very ſhort, and do not extend beyond the edges of the articular facettes: but there are others longer to be ſeen above, below, and behind theſe ſymyhyſes.

"The *os ſacrum* is not only articulated with the ilia, but with the ſpine and coccyx. It is joined in three places to the ſpine: 1. By an oblong and cartilaginous impreſſion in the middle of the baſis, which unites it to a ſimilar impreſſion in the body of the laſt *lumbar vertebra*, by means of an elaſtic ſubſtance. 2. By two little articular maſſes fixed in the poſterior edge of that firſt impreſſion, and which anſwer to ſimilar ſubſtances in the vertebra abovementioned.

"The elaſtic ſubſtance which unites the middle of the baſe of the ſacrum to the ſpine, is entirely ſimilar in its nature to that ſeen between the bodies of all the vertebræ. Being very thick before and thin behind, the angle reſulting from the diſpoſition of the articular facettes of theſe two parts is rendered more obtuſe. This *ſacro-vertebral* junction is ſurrounded by an infinity of ligaments, ſome without and others concealed within the ſpinal canal. All motion is not prohibited by this kind of junction; but, as it only depends on the compreſſion of the intermediate ſubſtance, it can be but very ſmall. The motion between the body of the laſt lumbar vertebra and the baſe of the ſacrum, is never extenſive enough to make any alteration in the degree of acuteneſs of the angle which reſults from their junction; but the convexity of the lumbar column may be augmented or diminiſhed by means of a compound motion, formed of thoſe which take place between each of the lower lumbar vertebræ and between the lower ones of the back. This augmentation or diminution of the convexity, in proportion as the trunk is bent backward or forward, or by raiſing or lowering the breech when the woman lies on her back, deſerves particular attention in the practice of midwifery; for thus we may make a favourable change in the direction of the axis of the pelvis, relatively to that of the trunk, to that of the uterus, and in the direction of the expulſive forces of the latter, which may be rendered more or leſs efficacious according to circumſtances, by making the woman preſerve a proper attitude.

"The junction of the coccyx with the ſacrum permits the former to move, and yield to the different degrees of preſſure it undergoes in different circumſtances. The mobility is very great in youth; but diminiſhes inſenſibly as the patient grows older, and at laſt is totally loſt. If entirely loſt, or conſiderably diminiſhed, before a woman is paſt child-bearing, it produces ſometimes, though very rarely, an obſtacle to delivery. The connections of the pelvis with the inferior extremities are not of much importance in midwifery. The natural courſe of labour cannot be diſturbed by any fault in their configuration when the pelvis itſelf is well formed; but in general they are conſequences of a deformity of it. They are *enarthroſes*, which allow of motion in every direction."

The pelvis is divided into two parts, called the *upper* and *lower*, by a ridge ſometimes elliptical, and ſometimes of other ſhapes. The breadth of the upper part from the anterior ſuperior ſpine of one ilium to another, is uſually eight or nine inches, and its depth from three to four. At the back part of it is the projection of the lumbar vertebræ, and at the ſides the *iliac foſſæ*. The lower part forms a kind of canal, whoſe entrance and outlet are ſomewhat narrower than the middle; whence it has been diſtinguiſhed into the *ſuperior* ſtrait, the *inferior* ſtrait, and an excavation.—The *ſuperior* ſtrait is a kind of circle forming the entrance of the canal; its form, however, is various, as is alſo its obliquity from behind forwards. M. Levret has fixed this laſt at an angle of from 35 to 40 degrees.

The ſmalleſt diameter of this ſtrait is generally about four inches, extending from the middle of the projection of the ſacrum to the ſuperior and internal part of the ſymphyſis of the pubes. The other diameter

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diameter is uſually about an inch longer, extending from one ſide of the ſtrait to the other. The oblique diameters are a medium betwixt the two former, extending diagonally from each acetabulum to the ſacro-iliac junction of the oppoſite ſide. The pelvis is cut at right angles by the two former, and into acute ones by the latter; but the diameters, conſidered in relation to delivery, are ſomewhat different from thoſe juſt mentioned, ſome changes in them being occaſioned by the ſoft parts within the pelvis.

The inferior ſtrait is in general ſmaller, and of a more irregular figure than the other, being not formed like it entirely of bones. The edge, rendered unequal by three deep and large notches, is completed behind and at the ſides by the ſacro-iſchiatic ligaments, forming a kind of circular notch before, called the *arch of the pubes*. The diameters of it are commonly about four inches in length; and though the tranſverſe, which extends from one *iſchium* to the other, be often a little longer than that which extends from the fore to the back part, it muſt be reckoned the ſmalleſt with regard to delivery; becauſe the latter augments in proportion as the point of the coccyx recedes from the pubes. We muſt alſo remember, that the great diameter of the inferior ſtrait is parallel to the ſmalleſt of the ſuperior, and that it croſſes the longeſt of that ſtrait at an angle more or leſs acute; and by carefully attending to this, we may, in many caſes, with the finger alone, when properly directed, remove obſtacles which could not have been overcome even by means of inſtruments, without expoſing the child to great inconveniences. It is likewiſe favourable to delivery that the middle part of the pelvis is a little larger from before backwards than the ſtraits; which diſpoſition proceeds from the curved figure of the *os ſacrum*.—On one ſide this curve diminiſhes the numerous and long-continued frictions which the child's head would neceſſarily undergo if the pelvis were equally broad in all its parts; and on the other ſide it is equally uſeful in preventing the effects of a long and forcible preſſure on the ſacral nerves, which a flat form of the ſacrum would have rendered unavoidable during the whole time of the paſſage of the head. The cavity of the pelvis is commonly from four to five inches deep behind, three and an half at the ſides, and one and an half at moſt before.

The arch of the pubes, which at the top is only from one inch and a quarter to one and two-thirds in breadth, augments gradually as it deſcends; ſo that at the bottom its ſides are three inches and an half, or even four inches, ſeparated from one another; that is, if we take the line which is looked upon as the tranſverſe diameter of the inferior ſtrait for its baſe; the height being about two inches.

The axis of the ſuperior ſtrait of the pelvis cannot well be determined; but that of the inferior one, with regard to delivery, muſt be conſidered as paſſing through the centre of the opening of the vagina dilated by the child's head. Its direction is then ſo much inclined from behind forward, that its ſuperior extremity traverſes the lower part of the firſt falſe vertebra of the ſacrum, and croſſes that of the other ſtrait at a very obtuſe angle.

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Hitherto we have treated only of that form of the pelvis which is moſt favourable for delivery; but the proportions and forms of it are various; and as it differs from thoſe above deſcribed, the delivery is attended with more or leſs difficulty.

The defects of the pelvis, with regard to facility of delivery, conſiſts in its being either too large or too ſmall. At firſt ſight it might be imagined, that a large pelvis, would make the delivery more eaſy, as the head of the child will thus be expoſed to fewer frictions, be more eaſily expelled, and the labour be leſs painful. But women who have a very large pelvis, are ſubject to thoſe inconveniences which ariſe from on obliquity of the uterus, or even to a deſcent of it altogether; eſpecially in the time of labour, when that viſcus, being already charged with the weight of the child, is entirely ſubjected to the expulſive power of the abdominal muſcles. In women who have had ſeveral children, the uterus is but weakly retained by its ligaments; and in ſubſequent pregnancies it deſcends ſtill lower, until at laſt it reſts on the margin of the pelvis. This, however, does not take place before the concluſion of the firſt four or five months: before that time its weight lies principally on the extremity of the rectum; and by this, as well as by its bulk, the diſcharge of the urine and fæces is impeded, and accidents ſometimes enſue from the compreſſion of the veins which paſs through the pelvis. Theſe ſymptoms ſometimes vaniſh about the middle of pregnancy, but re-appear towards the latter end; becauſe the head of the child is early engaged in the pelvis, and acts on the ſame parts that the whole uterus did before. Beſides all theſe accidents, there are others which may take place at the time of delivery; ſo that upon the whole, it cannot be reckoned any real advantage for a woman to have a large pelvis.

The accidents, however, which ariſe from too great a ſize of the pelvis, are much more eaſily remedied, and in themſelves leſs dangerous, than ſuch as ariſe from its narrowneſs. This defect may be conſidered as either relative or abſolute. The former ariſes from an exceſs of ſize in the head of the child; the latter from a bad conformation of the pelvis itſelf. The abſolute narrowneſs of the pelvis rarely affects all parts of it at once; it is generally found only in one of the ſtraits; in which caſe, the other is uſually of the natural ſize, nay, ſometimes even larger than natural. The fault is more frequently in the ſuperior than the inferior ſtrait; and it is remarkable, that it moſt commonly affects the ſtrait in its ſmall diameter; very rarely in its tranverſal; ſometimes affecting only one ſide. In the inferior ſtrait it is generally cauſed by the approximation of the tuberoſities of the iſchia.

"It is eaſy (ſays M. Baudelocque) to determine why the ſuperior ſtrait is more frequently deformed than the inferior; and why it is almoſt always between the pubes and ſacrum that it is defective reſpecting delivery. If we conſider the direction of the forces which act on the pelvis of rickety children, in whom the bones are at the ſame time ſofter and more looſely connected than in the natural ſtate, we ſhall ſee that the greater part of theſe forces tend to carry the baſe of the ſacrum forward and the os *pubis* backwards. Whether the child be ſtanding or ſitting, if we attend to the direction of the ſpinal column, we ſhall ſee that the weight of the body muſt inſenſibly puſh the baſe of the ſacrum towards the pubes; and that it acts in the ſame manner on the inner parts of the acetabula, which ſerve as a fulcrum to the inferior extremities when the child is ſtanding or walking. The *oſſa pubis*, particularly in theſe latter caſes, muſt be puſhed towards the ſacrum; in ſuch a manner, however that their poſterior extremities often approach a little nearer to the projection of the baſe of that bone than their anterior extremities, or the ſymphyſis. If the ſuperior ſtrait does not conſtantly preſent the ſame figure in deformed *pelviſes;* if it is ſometimes larger on one ſide than the other; if one of the acetabula is nearer to the ſacrum, while the other approaches leſs; if the ſymphyſis of the pubes is removed, in many caſes from a line which would divide the body into two equal parts—it is becauſe the rickets have not equally affected all the bones of the pelvis, nor equally hurt all their junctions; and becauſe the attitude which the child takes in walking or ſitting may change a little the direction of the compreſſing powers juſt mentioned. The weight of the body may alſo equally hurt the form of the inferior ſtrait, but variouſly, according to the moſt uſual attitude of the child and the direction taken by the ſpinal column. For example; If it ſits much, the ſacrum will be more curved, and the ſtrait more contracted from before backwards: in this attitude, if it inclines habitually to one ſide, one of the iſchiatic tuberoſities will be thrown inwards, the *os ilium* will be more elevated, &c. The action of the muſcles which are attached to the pelvis, the preſſure of cloaths, and that which the arms of the nurſe exert on this part, contribute alſo ſomething to the deformities in queſtion, but much leſs than the weight of the trunk: whence we ſee, of what importance it is to keep rickety children in bed, and leave them at liberty; inſtead of obliging them to walk, to ſit up, or have them conſtantly in the arms, as is done almoſt every where."

The dimenſions of the pelvis itſelf vary no leſs than the contour of the ſtraits. If the diameter of ſome, taken from the pubes to the middle of the projection of of the *os ſacrum*, be only a few lines; in others the defect is ſeveral inches, ſo that ſcarcely a ſingle inch is left between theſe bones. Theſe extremes, however, are not frequently met with; and the latter of them is never ſo great in the inferior as in the ſuperior ſtrait. On comparing the dimenſions of a well-formed pelvis with thoſe of a child's head, we ſhall find that the former might admit of being ſome inches leſs in circumference, and yet be large enough for an eaſy delivery. The circumference of a common head is uſually no more than ten inches and a quarter, or ten and an half. The firſt degree of narrowneſs in any pelvis therefore muſt be, when each diameter is ſomething leſs than three inches and an half. M. Baudelocque ſays, that he has ſeen pelviſes in which the diſtance of the pubes from the ſacrum ſuperiorly was no more than ſix or eight lines; and he had in his poſſeſſion two others, in one of which the diſtance from the back of the right acetabulum to the projection of the ſacrum was only three or four lines, and the other had but 14 lines between that projection and the ſymphyſis of the pubes.

The narrowneſs of the pelvis is to be acounted one of the principal cauſes of difficult delivery.—When an opening of only three inches and a quarter is left, the labour muſt be more difficult than when it is three inches and an half, as the number of frictions which the child's head muſt undergo are then more numerous and frequent. When there is an opening only of three inches, the labour muſt be ſtill more difficult; but ſtill there are inſtances of natural deliveries without any aſſiſtance, notwithſtanding the diſproportion betwixt the ſize of the child's head and pelvis. This may even happen when the diameter of the pelvis is ſtill ſmaller, ſuch as two inches and three quarters, or two and an half. M. Solayres obſerved in a caſe of this kind, that the head was lengthened in ſuch a manner, that its longeſt diameter was eight inches all but two lines, that which goes from one parietal protuberance to the other being reduced to two inches five or ſix lines; and M. Baudelocque has obſerved ſimilar changes in the form of the head, and the reſpective lengths of its diameters at the inſtant of birth, where the child was equally deformed, the long diameter being ſeven inches, and the tranſverſe one two inches ſix or ſeven lines. The children were in good health; and the day after their birth their heads wanted very little of the uſual proportions.

But when the ſmall diameter of the pelvis is leſs than two inches and an half, the head of the child cannot paſs; and then ſome of the dangerous chirurgical methods muſt be undertaken, which frequently prove fatal both to the mother and child. Even when the pelvis is two inches and an half in diameter, the natural delivery is not always without danger to both; as, on one hand, the ſoft parts which cover the pelvis are ſubjected to ſuch violent preſſure that they become inflamed, exquiſitely painful, and at laſt are even threatened with gangrene; on the other, the bones of the child's cranium riding over one another, or ſometimes fractured and depreſſed, wound the brain, and produce internal extravaſations which generally prove fatal. The bad conſequences reſulting from a deformed pelvis, ſhow themſelves ſooner or later, according as the ſuperior or inferior ſtrait is vitiated. When both are ſo, the obſtacles to the birth begin to manifeſt themſelves as ſoon as the labour begins: and ſometimes thoſe at the ſuperior ſtrait are ſo great that the expulſive powers are exhauſted, and the head ſtops there; or if it be puſhed farther into the pelvis, and ſtopping there, it will remain incapable of being delivered without the aſſiſtance of art. The head cannot paſs this ſtrait without being in a conſiderable degree elongated; and when it enters the pelvis, the cavity being there ſufficient for it, it naturally returns to its former dimenſions, at leaſt in part, and more or leſs ſo as it ſtays a longer or ſhorter time. The ſame conformation of the head, however, which enabled it to paſs the firſt ſtrait, is ſtill more neceſſary to enable it to paſs the ſecond: and hence the ſymptoms which had come on with the firſt pains, ſometimes diſappear in a great meaſure during the time that the head ſtays in the excavation; but increaſe to

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a greater degree than ever when the ſtrong labour comes on.

When the ſuperior ſtrait alone is contracted, the head advances at firſt with great difficulty; but as ſoon as the parietal protuberances have cleared the ſtrait, the other parts of the pelvis being relatively or abſolutely larger, the head paſſes them with ſo much eaſe, that the delivery is frequently terminated by a few pains. The contrary is obſervable when the fault is in the inferior ſtrait, if the firſt be of the uſual ſize. The head then deſcends eaſily into the lower part of the pelvis; but cannot proceed any farther, until it overcome the obſtacles which obſtruct its courſe, and render it difficult and laborious. In this caſe, the ſymptoms attending obſtruction appear later than in the former. In theſe caſes, however, it is neceſſary that the practitioner ſhould accuſtom himſelf by practice to form a juſt eſtimate of the powers of nature, otherwiſe he may eaſily deceive himſelf; in the former, ſuppoſing that a delivery is impoſſible; and in the latter, that a delivery will be eaſy which cannot be effected without the aſſiſtance of art. An inſtance of this is given by our author, in a caſe to which (he ſays) more than forty perſons were witneſſes.

The operator pronounced that the woman would be ſpeedily delivered, on account of the facility with which the child's head had engaged with the firſt pains; and attributing the obſtacles which ſoon after obſtructed its courſe to another cauſe, raſhly deſtroyed the child by uſing the crotchet, when its life might have been preſerved by other means, having waited two days in blind ſecurity, expecting a natural delivery. M. Baudelocque obtained poſſeſſion of the pelvis of this woman after ſhe died; and tells us, that the circumference of the ſuperior ſtrait of the pelvis, when diveſted of all its coverings, meaſured 14 inches, but the inferior only *nine*. The diſtance from the point of the os ſacrum to the ſymphyſis of the pubes, as well as the interval between the iſchiatic tuberoſities, was but three inches. The cavity of this pelvis diminiſhed inſenſibly in breadth from one ſtrait to the other, and was as regular as poſſible in its contour.

The excavation, or middle part of the pelvis, is much more ſeldom defective in its form than the ſtraits; and when this is the caſe, it muſt ariſe from ſome exoſtoſis, or from the ſacrum deſcribing a right line in its anterior part, inſtead of being curved as uſual. The ſtraight and flat form of the ſacrum generally produces fewer obſtacles to delivery than the too great curvature of it. The former fault generally affects only the cavity of the pelvis, and cannot hinder the paſſage of the child, if the canal be otherwiſe well diſpoſed: but the latter, or too great a curve of the ſacrum, commonly proves injurious to both ſtraits, contracting them from before backwards, and at the ſame time diminiſhing the depth of the pelvis at the back part, as well as the reſpective height of the arch of the pubes. In theſe caſes the head, though it paſſes the firſt ſtrait with difficulty, cannot paſs the ſecond; being ſtopped in its courſe by the inferior part of the ſacrum before the occiput is long enough to engage under the arch.

Labours may alſo be rendered difficult by too great a length of the ſymphyſis of the pubes; a want of elevation, or breadth of the arch of theſe bones; the length and wrong direction of the iſchiatic ſpines, as well as a conſolidation of the coccyx with the point of the ſacrum. Theſe faults, however, are very rare, if we except the conſolidation of the coccyx: they are ſcarce ever met with alone, and are generally the conſequences of a bad conformation of the reſt of the pelvis. Even this conſolidation, however, though more common than the other faults, yet cannot obſtruct delivery ſo frequently as has been imagined; and when it does ſo, it is only in women who have a narrow pelvis. Our author denies the poſition laid down by ſome, that the head of the child, in all caſes, puſhes back the point of the coccyx half an inch, or even a whole inch. Thoſe who aſſert this (he ſays) know not the relation betwixt the dimenſions of the head and the inferior ſtrait in moſt women. Whence he cannot recommend a precept founded upon this principle, by which it is directed to puſh back the coccyx, when the head, though low down, cannot diſengage itſelf eaſily.

We muſt now conſider a ſubject on which the writers upon midwifery have been greatly divided, viz. the ſeparation of the bones of the pelvis in the time of labour. Some have imagined that this ſeparation took place in all labours; others that it happened only in difficult caſes; ſome, that it indicates a morbific ſtate; and ſome that it was quite impoſſible.— M. Baudelocque allows the poſſibility of ſuch a ſeparation, but denies that it happens ſo frequently as is imagined. "Experience (ſays he) demonſtrates, that this ſeparation, far from being common, is very rarely met with, and is not more uſual after a laborious than after an eaſy labour, nor in a diſtorted pelvis than in one well formed. I have ſought for it twenty times in all theſe caſes, by opening the bodies, and have ſcarcely met with one which could remove all doubt of its exiſtence." In thoſe caſes where it takes place, he is of opinion, that the filtration of ſerum into the ligamentous tiſſue of the ſymphyſis, muſt be regarded as the uſual prediſpoſing cauſe. The remote cauſe, of conſequence, muſt be whatever produces this filtration. This, he thinks, cannot be done merely by the preſſure of the gravid uterus on the trunks of the veſſels which are diſtributed to theſe ſymphyſes. An alteration in the fluids themſelves he ſuppoſes likewiſe to be neceſſary.

But though the prediſpoſing cauſe of this ſeparation muſt be the relaxation of the ſymphyſes by the infiltration of ſerum, we are not to look upon the ſwelling of the cartilages by means of this infiltration to be the immediate cauſe: For however the ligaments may be relaxed, the cartilages which incruſt the extremities of the oſſa pubis, as well as the articular facettes of the oſſa ilia and the ſacrum, are no thicker; ſo that they cannot, as ſome have ſuppoſed, act like wetted wedges by which large blocks of ſtone may be cleaved. "The wedge by which the bones of the pelvis are ſeparated (ſays our author), does not act between the extremities of theſe bones, but in the circle formed by their aſſemblage in the pelvis itſelf: it is the uterus charged with the produce of concep-

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tion in the latter periods of pregnancy, and the child's head forced down by the action of the uterus, and of the abdominal muſcles in time of labour."

This ſeparation, however, is not always the effect of a relaxation and ſtretching of the ligamentous tiſſue of the ſymphyſis. In ſome caſes, where the obſtacles which obſtruct the paſſage of the child are very great, and the efforts for its expulſion very ſtrong and laſting, the ſymphyſes tear, and permit the bones to ſeparate much farther than they could have done by a ſimple relaxation. "I muſt add (ſays our author) that it is not the ſymphyſis of the pubes, properly ſpeaking, which tears; for no effort can break the ligamentous ſubſtance which unites theſe bones to each other; the ſymphyſis detaches itſelf from one of them, and leaves the bone naked." The ſeparation in queſtion has likewiſe frequently taken place in inſtrumental deliveries, to which the natural efforts ſeemed to contribute nothing; and it has alſo been found in conſequence of a ſtroke or fall.

"Being deceived in the principle of this ſeparation (ſays M. Baudelocque), they neceſſarily erred in the conſequence deduced from it. It has been ſo firmly believed to take place in all labours, that it was thought to be abſolutely neceſſary; and that without it many women could not be delivered without extreme difficulty. Having thus miſtaken the neceſſity and pretended advantages of this ſeparation, the natural reſiſtance of the ſymphyſes, and above all the dryneſs and rigidity neceſſarily induced in them by age, were conſequently reckoned among the cauſes of difficult and laborious births. Obſtacles have been attributed to the ſtate of theſe ſymphyſes, which merely depended on the reſiſtance of the neck of the uterus, and of the external parts; and it has been recommended to moiſten and relax them by the uſe of baths, cataplaſms, liniments, fomentations, &c. But what can be expected from ſuch methods, when delivery is obſtructed by a narrow pelvis? Will any one venture to aſſert, that he has once by ſuch means obtained the effect he expected, and that he has thus aſſiſted labours which could not otherwiſe have been terminated but by the Cæſarean operation, as has ſo often been publiſhed? I ſhould have diſpenſed with demonſtrating the fallacy which has prevailed on this point, if it had not led ſome practitioners into a very ſerious conſequence. In order to appretiate all theſe means, and fix the degree of confidence to be placed in them, ſuppoſing that they could operate to the relaxation of the ſymphyſis of the pelvis, it is neceſſary to determine what degree of amplitude can be given to that cavity by the ſeparation of the bones which conſtitute it. The oſſa pubis cannot ſeparate without augmenting the circumference of the pelvis; but how much will its diameter be increaſed? If the circumference were perfectly circular, every poſſible diameter would partake a third of that augmentation; but as the entrance of the pelvis is in general the more elliptic as it deviates more from its natural ſtate, it follows, that its different diameters cannot increaſe in the ſame proportion; and we may ſay that there is none but the tranſverſe one which can become larger. In a moderate ſeparation the *antero-poſterior* diameter is ſcarce at all augmented; and it has been repeatedly demonſtrated, that the oſſa pubis muſt ſeparate at leaſt an inch to procure two lines in that direction; while the tranſverſe diameter ſhall be increaſed ſix lines, and often more.

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"The pelvis being larger in moſt women than is neceſſary for their delivery, the ſeparation of the bones could be of no advantage to them, nor render their delivery more eaſy. Far from regarding it, with ſome ancient authors, as a benefaction of nature, we ought to conſider it as an additional ſource of inconveniences in thoſe women who are ſubject to it; for, on one ſide, we ſee that a pelvis too large expoſes the woman to a number of accidents; and on the other, that there are ſome which inevitably accompany the ſeparation, and the mobility of the bones which form that cavity. Far from favouring delivery in all theſe caſes, it could not but render it more tedious and painful to the woman, as experience has convinced me. If we ought to expect any real advantage from it, conſidering it only with reſpect to the paſſage of the child, it could only be in thoſe women who have the pelvis deformed, and where the defect which rendered delivery impoſſible did not exceed two lines at the moſt; ſince a ſeparation of an inch cannot procure an augmentation of more than two lines in the ſmall diameter of the ſuperior ſtrait, which is almoſt always that which occaſions the greateſt obſtacles to the exit of the child. If from a ſeparation of an inch, which has never taken place between the oſſa pubis without a rupture of their ſymphyſis, we are not to expect an augmentation of more than two lines in the direction of the little diameter of the ſuperior ſtrait, what can we obtain from a ſeparation always much leſs, and ſo little apparent in moſt women that we may doubt its exiſtence? The examination of a great number of women who have died in child-bed has proved to me that it is exceſſively rare for the ſeparation in queſtion to amount to two lines; and I never found it exceed that but once. But ſuppoſing (what is impoſſible) that art could procure a ſeparation of an inch between the oſſa pubis without dividing their ſymphyſis, what practitioner would dare to affirm without fear of being deceived, that the volume of the child's head did not exceed the little diameter of the ſuperior ſtait by more than two lines? If it is difficult to eſtimate juſtly the degree of opening in the pelvis, it is much more difficult ſtill to judge of the child's head; and it is only by taking the mean between the largeſt and the ſmalleſt that we uſually eſtabliſh the relation of its dimenſions to thoſe of the pelvis; but a *thereabouts*, in the caſe ſuppoſed, cannot ſupply the place of that preciſion which would be neceſſary."

From his reaſoning upon this ſubject, M. Baudelocque concludes directly againſt the operation of cutting the ſymphyſis of the pubes, as being not only uſeleſs, but attended with very dangerous conſequences. "When this ſeparation (ſays he) has been ſuddenly made, ſevere pains in the parts divided, an impoſſibility of walking, and ſometimes even of moving the inferior extremities, inflammation, fever, abſceſſes, caries, and laſtly death itſelf, have generally been the effects of it; but when a relaxation only takes place, the conſequences are leſs ſevere; a painful and tottering walk being the only ſymptom attending it. If the relaxed ſymphyſis at laſt grow firm again, if the bones of the pelvis recover their former ſtability, if

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the lameneſs goes off entirely in ſome women, how often, on the contrary, have we not obſerved an inability to walk, or even to move the legs, without violent pain, continue for years afterwards?"

Theſe violent ſymptoms frequently attend even ſlight ſeparations of the bones in queſtion. M. Baudelocque gives an inſtance of a woman who had kept her bed ten months, being all that time afflicted with the moſt excruciating pains in the junction of the oſſa pubis, and of one of the ilia, with the ſacrum, whenever ſhe attempted to move the inferior extremities, though no ſeparation of the ſymphyſis could be diſcovered, nor any thing beſides a ſlight mobility in that of the pubes. The accident had been perceived during the time of labour, and the midwife had been accuſed of luxating the bones

Dr Denman has alſo treated this ſubject at conſiderable length. He informs us, that for many centuries it was believed that theſe bones were always ſeparated during the time of labour; or that there was a diſpoſition to ſeparate, and an actual ſeparation, if the neceſſity of any particular caſe required that enlargement of the cavity of the pelvis which was conſequent to it. The degree of ſeparation was alſo ſuppoſed to be proportioned to ſuch neceſſity; and when this did not happen naturally, inſtruments were made uſe of for diſtending the parts: and, on the ſame principle, the ſection of the ſymphyſis of the pubes has been recommended. "This opinion (ſays he) ought probably to be aſſigned as one reaſon for the ſuperficial notice taken by the early writers on midwifery of thoſe difficulties which are ſometimes found to occur in parturition from the narrowneſs or deformity of the pelvis. To this may alſo be referred much of the popular treatment of women in child-bed, and many popular expreſſions in uſe at preſent. But this opinion has been controverted by many writers, who aſſert, that there was neither a ſeparation nor a diſpoſition to ſeparate; but that when either of them did happen, they were not to be eſteemed as common effects attendant on the parturient ſtate, but as diſeaſes of the connecting parts. The diſputants on each ſide have appealed to preſumptive arguments, and to facts proved by the examination of the bodies of thoſe who died in child-bed, in juſtification of their ſeveral opinions. But notwithſtanding all that has been ſaid, I know not that we are authoriſed by the experience of the preſent time to ſay, that a ſeparation, or a diſpoſition to ſeparate, prevails univerſally at the latter part of pregnancy, or at the time of labour: yet that theſe effects are often, if not generally produced, may be gathered from the pain and weakneſs at the parts where the bones of the pelvis are joined to each other before and after delivery. In ſome caſes alſo pregnant women are ſenſible of a motion at the junction of the bones, eſpecially at the ſymphyſis of the oſſa pubis; and the noiſe which accompanies it may ſometimes be heard by the byſtanders.

"A ſtrong preſumptive argument in favour of the ſeparation of the bones has been drawn from quadrupeds. In theſe the ligaments which paſs from the obtuſe proceſſes of the iſchia to the ſacrum, on which the firmneſs of the junction of the bones very much depends, and which at all other times reſiſt any impreſſion attempted to be made upon them, are for ſeveral days previous to parturition gradually deprived of their ſtrength, and the animal walks in ſuch a manner as would incline us to believe could only be produced by a ſeparation of the bones of the pelvis. Now it is not reaſonable to conclude, that a circumſtance which generally takes place in one claſs of viviparous animals ſhould never occur in another, eſpecially in a matter in which there is not eſſential difference."

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Notwithſtanding theſe arguments, however, Dr Denman does not look upon the matter to be yet abſolutely decided. No perſon, he ſays, who has been converſant in the diſſection of women who have died in child bed, can have wanted opportunities of ſeeing every intermediate ſtate of theſe parts, from a ſeparation in which the ſurfaces of the bones were looſened and at a conſiderable diſtance from each other, to that in which there was not the leaſt diſpoſition to diſunite.

When this ſeparation takes place beyond a certain degree, it is to be looked upon as morbid: and, he ſays, that it may be produced by the two following cauſes. "*1ſt*, A ſpontaneous diſpoſition of the connecting parts. *2dly*, The violence with which the head of the child is protruded through the pelvis." Of each of theſe caſes he gives an example.—The firſt was of a young lady of a healthy conſtitution, who had been married in the 21ſt year of her age, and in 1774 was delivered of her third child, which was unuſually large, and the labour was ſevere and tedious. For ſeveral days before delivery ſhe had been ſo much afflicted with pain and weakneſs in her loins, that ſhe could not walk without aſſiſtance. She recovered without any unfavourable circumſtance, excepting that for ſeveral weeks ſhe was incapable of ſtanding upright, or putting one foot before the other; the attempt to do either being attended with pain and a ſenſation of looſeneſs and jarring, both at the parts where the oſſa innominata are joined to the ſacrum, and at the ſymphyſis of the oſſa pubis. By the uſe of ſtrengthening medicines ſhe recovered, and in a few months was perfectly well."

It being ſuſpected that the complaints abovementioned had proceeded from too frequent parturition, ſhe was adviſed to ſuckle her child for a longer time than uſual; and accordingly continued a nurſe for 15 months. Soon after this ſhe became with child a fourth time. The complaints which had accompanied her former pregnancy now came on ſooner, and with greater violence than before, inſomuch that for three weeks before delivery ſhe could neither walk nor ſtand; and there was reaſon to ſuppoſe that the bones of the pelvis were ſeparating. She was delivered on the 7th of July 1777, the labour being accompanied with faintings, great irritability, and a total inability to move her inferior extremities. A few days after her delivery ſhe had a fever, which terminated in an abſceſs in one of her breaſts, by which ſhe was confined to her bed for near ſeven weeks. In nine weeks ſhe could walk with crutches, and received conſiderable benefit by being ſent into the country; and likewiſe, as ſhe imagined, by drinking half a pint of infuſion of malt twice a-day. In about five months ſhe was able to walk without aſſiſtance; though ſometimes ſenſible of

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of the motion of the bones, which ſeem never to have been perfectly united.

About Chriſtmas the ſame year, this lady became again pregnant; and in the month of July 1778 ſhe began to feel an inability to move; which, however, was attributed to the heat of the weather: but on a ſudden the pain and weakneſs of her back returned to ſuch a degree, that ſhe could walk no more till the 11th of October, when ſhe was delivered of a fine child, but after a moſt ſevere and tedious labour, occaſioned in a great meaſure by her being totally unable to move. The ſymptoms after her delivery became very extraordinary and alarming. On the fourth day a fever came on; and though this was ſoon removed, the pain at the junction of the bones ſtill continued. She had no command of her inferior extremities; and the pain when ſhe was moved, became ſo excruciating, that ſhe felt as if tearing aſunder. Her ſtomach was at all times much diſturbed; but when the pain became violent, a nauſea, vomiting or hiccough came on. Strange ſympathies were produced in various parts; as a teaſing cough, ſneezing, ſenſe of weight in her eye-lids, which could not be kept open though there was no inclination to ſleep. There was a noiſe in the bowels, and other nervous affections, all of which ceaſed when the pain was allayed by opiates.

Having remained for ſeveral months in this deplorable ſituation, it was at laſt thought proper to raiſe her from her bed, and cauſe her to make an effort to ſtand or walk, leſt her complaints ſhould be made worſe by ſuch a long courſe of inactivity. She had now, however, totally loſt the power of ſupporting herſelf; the motion of the bones was plainly perceived; and the conſequences of every trial were ſo painful, that there was a neceſſity for deſiſting. In 1779 ſhe was removed, upon a couch, in a boat to Margate, for the benefit of the air and ſea-bathing, from which ſhe was always ſenſible of receiving advantage. In this place ſhe continued to reſide; and in *eight years* after her delivery became able to walk without crutches.

The ſecond caſe was of a young woman of a healthy but delicate conſtitution, who was in labour of her firſt child. The pains were ſo ſtrong, that the head of the child was forced through the external parts, and the perinæum ſuppoſed to be lacerated, in ſpite of all the oppoſition which could be made. At the inſtant when the head of the child was expelled, the operator perceived ſomething to jar under his hand, and was even ſenſible of a noiſe, which he attributed to the laceration of the perinæum. In a little time the placenta was extracted without hurry or violence; and a few drops of *tinctura opii* were given to allay the uneaſineſs which took place, and was ſuppoſed to be occaſioned by *after pains*. On the following days, however, ſhe complained of an uneaſineſs in the region of the abdomen; but no particular notice was taken of it, as the milk was regularly ſecreted, and there was no ſymptom of fever; but on the fourth day, when taken out of bed, ſhe was found to be unable either to ſtand or ſit on her chair by reaſon of the pain and weakneſs in the part of which ſhe originally complained. This was afterwards conjectured to ariſe from a ſeparation of the bones of the pubes; to which conjecture the long continuance of the complaint ſeemed to give countenance. The conjecture was founded on the poſitions and attitudes in which the patient ſought to find relief. The ſymptoms were as follow.—When ſhe endeavoured to ſtand upright, which ſhe could do better upon one foot than both, and with her feet cloſe than at a diſtance, together with the pain at the ſymphyſis, ſhe had a ſenſe of extreme weakneſs, accompanied with a faintneſs. When ſhe firſt ſat down on her chair, reſting her elbows upon the arms, the complaints became tolerable. When ſhe had remained a little time in this poſition, they again became importunate, and ſhe ſupported herſelf with her hands upon her knees, and preſently bent forwards, ſo as to lean her elbows upon her knees; this poſition becoming irkſome, ſhe was obliged to return to her bed, where ſhe became immediately eaſy. When ſhe firſt atttempted to walk, ſhe was compelled to bend forwards in ſuch a manner as to reſt her hands upon her knees, making a ſtraight line from her ſhoulders to her feet. At the end of 14 weeks, whilſt ſhe was in a coach, into which ſhe had often been lifted for the benefit of air and exerciſe ſhe had a diſcharge which ſhe ſuppoſed to be menſtruous; but which, though it ceaſed before her return, gave immediate relief. From this time ſhe became better every day, and in ſix weeks was able to walk. She had afterwards three children, with which her labours were eaſy, and ſhe never had any return of the abovementioned complaints.

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From all this it is evident, that Dr Denman differs conſiderably in his opinion from M. Baudelocque concerning the ſeparation of theſe bones. According to him, it appears that this ſeparation, though extremely painful, does not ſeem to be attended with *fatal* conſequences; and with regard to the *quantity* of the ſeparation, it muſt undoubtedly be ſometimes much greater than what M. Baudelocque ſuppoſes; for Dr Denman brings an inſtance from the 484th number of the Philoſophical Tranſactions, in which the bones were ſeparated to the diſtance of *four inches*. This happened in conſequence of the ſtarting of a horſe when a gentleman was riding. He obſerves, however that, in women the violence which the connecting parts of the bones undergo when the head of the child is protruded through the pelvis with extreme difficulty, ſometimes occaſions an affection of more conſequence than even the ſeparation of the bones themſelves. This is the formation of matter upon the looſened ſurfaces of the bones, preceded by great pain, and other ſymptoms of inflammation.

In the beginning of this complaint, it is difficult to aſcertain whether the connecting parts of the bones or ſome of thoſe contiguous, be the ſeat of the diſeaſe; but when ſuppuration has taken place in conſequence of the injury ſuſtained at the junction of the oſſa innominata with the ſacrum, the abſceſs has ſometimes been cured by the common treatment, having formed in the neighbourhood of the injured part. At other times, when matter has been formed about the ſymphyſis of the os pubis, hectic ſymptoms have enſued; and the cauſe of them only diſcovered after the patient died. In ſome caſes the matter has burſt through the capſular ligament of the ſymphyſis at the inferior edge, or perhaps made its way into the bladder; and in others it has inſinuated itſelf under the *perioſteum*, continuing its courſe along the pubes, until it arrives at the acetabulum. Thus all the ſymptoms were aggravated; and the matter making its way towards the ſurface, a large abſceſs has been formed on the inner or fore-part of the thigh, or near the hip; ſo that the patients have at laſt ſunk under the fever and profuſe diſcharge from the ulcer. On diſſecting thoſe who have died in this manner, the track of the matter has been followed from the aperture of the abſceſs to the ſymphyſis, the cartilages of which were found to be eroded, the bones carious, and the adjacent parts very much injured or deſtroyed. Our author imagines it poſſible, by means of ſome particular ſymptom, to diſcover whether or not there be any diſpoſition in the parts abovementioned to ſuppurate, or to know when ſuppuration has taken place. In all caſes of unuſual pain attended with equivocal ſymptoms, the parts ought to be examined with great care and attention: for where there is any diſpoſition to ſuppurate, it might perhaps be removed by proper means; and when the matter is formed, if there be a ſwelling in the ſymphyſis, and, more eſpecially, if a fluctuation could be perceived, the propriety of making an inciſion to evacuate the matter, and prevent farther bad conſequences, might be determined.

With regard to the poſſibility of re-uniting the bones of the pelvis after they have once been ſeparated, our author has the following obſervations.

"When the connection of the bones of the pelvis has either been impaired or deſtroyed, it is probable that a confirmation or re-union may take place by a reſtoration of the original mode, by a callus, or by anchyloſis. But it is likewiſe poſſible that the bones may remain in a ſtate of ſeparation, and an articulation be formed by the ends of each bone, at the ſymphyſis of the oſſa pubis, and at the junction of the oſſa innominata with the os ſacrum." Of this laſt the Doctor has ſeen one inſtance in a dead body, and has had reaſon to ſuſpect the exiſtence of it in ſome living perſons. In the lower degrees of imperfection the former method of union probably takes place; as the complaints made by women of pain and weakneſs, after delivery, generally go off before their month of confinement is elapſed; but when they continue for a longer time, the beſt method is to enjoin the patient reſt and an horizontal poſture. In an increaſed degree of the complaint, where the health of the patient is affected, a longer time will be required for the recovery; but ſhould the injury be too great to admit of the reſtoration of the original mode of union, a much longer time will be requiſite for the formation of a callus, if this ever takes place except as a previous ſtep to an anchyloſis. This laſt has been obſerved frequently to take place at the junction of the oſſa innominata with the ſacrum, but never at the ſymphyſis of the pubes. In this caſe little can be expected excepting from ſuch remedies as tend to reſtore the conſtitution to its priſtine vigour; and in the firſt caſe above related, the only thing from which the patient ſeemed to obtain relief was the cold-bath. She was likewiſe much aſſiſted by the uſe of a ſwath, or broad belt, made of ſoft leather, quilted, and buckled with ſuch firmneſs over the lower part of the body as to leſſen, if not prevent, the motion of the bones; and this was kept in its ſituation by a bandage paſſed between the legs, from the hind to the fore part of the belt. But when a joint is formed between the ſeparated ſurfaces of the bones, all hope of recovering the patient to her former health may be given up. The only thing which can then be done for her relief muſt be by the uſe of a belt, or ſome ſimilar contrivance, to ſubſtitute, as much as poſſible, artificial firmneſs, in ſtead of natural. Dr Denman ſaw one caſe in which he ſuſpected this to have happened, and in which the life of the patient was truly miſerable: He is of opinion, however, that it very rarely occurs; having been informed of another perſon, who, after eight years confinement to her bed, in conſequence of the ſeparation of the bones in the time of labour, was at laſt reſtored to the perfect uſe of her inferior extremities. Inſtances alſo, though rare, have occurred, in which women, after labours, have ſuffered much pain in the region of the ſacrum, and totally loſt the power of moving their inferior extremities.—This has been ſuppoſed a paralytic affection, and they are ſaid to be bed ridden; but as theſe patients have generally been reſtored, though after a very long confinement, our author thinks it reaſonable to ſuppoſe that their infirmity had been occaſioned by a ſeparation of the bones, which at different periods after the accident, according to the degree of their ſeparation, had recovered their former connection and ſtrength.

Chap. II. *Of Pregnancy.*

At the time of conception, and for ſome time after, the parts which form the ſmall fœtus are ſo blended together, that one cannot be diſtinguiſhed from another. The whole maſs is then called an *ovum*. This ovum conſiſts of four membranes; the placenta or after-birth; the funis umbilicalis or navel-ſtring, leading to the child; and the ſurrounding watery fluid in which it floats. Before the child acquires a diſtinct and regular form, it is called *embryo*, and afterwards retains the name of *fœtus* till its birth. For the increaſe and nutrition of the fœtus, ſee Anatomy, nº 109. 110.

During the progreſs of impregnation the uterus ſuffers conſiderable changes; but, though it enlarges as the ovum increaſes, yet in regard to its contents, it is never full; for, in early geſtation, theſe are confined to the fundus only; and though the capacity of the uterus increaſes, yet it is not mechanically ſtretched, for the thickneſs of its ſides do not diminiſh; there is a proportional increaſe of the quantity of fluids, and therefore pretty much the ſame thickneſs remains as before impregnation.

The gravid uterus is of different ſizes in different women; and muſt vary according to the bulk of the fœtus and involucra. The ſituation will alſo vary according to the increaſe of its contents and the poſition of the body. For the firſt two or three months, the cavity of the fundus is triangular, as before impregnation; but as the uterus ſtretches, it gradually acquires a more rounded form. In general, the uterus never riſes directly upwards, but inclines a little obliquely, moſt commonly to the right ſide; its poſition is never, however, ſo oblique as to prove the ſole cauſe either of preventing or retarding delivery; its increaſe of bulk does not ſeem to ariſe merely from diſtention, but to depend on the ſame cauſe as the extenſion of the ſkin in a growing child. This is proved from ſome late inſtances of extra uterine fœtuſes, where the uterus, though there were no contents, was nearly of the ſame ſize, from the additional quantity of nouriſhment tranſmitted, as if the ovum had been contained within its cavity.

The internal ſurface, which is generally pretty ſmooth, except where the placenta adheres, is lined with a tender efflor eſcence of the uterus, which, after delivery, appears as if torn, and is thrown off with the cleanſings. This is the *membrana decidua* of Dr Hunter.

Though the uterus, from the moment of conception, is gradually diſtended, by which conſiderable changes are occaſioned, it is very difficult to judge of pregnancy from appearances in the early months. For the firſt three months the os tincæ feels ſmooth and even, and its orifice as ſmall as in the virgin ſtate. When any difference can be perceived, about the fourth or fifth month from the deſcent of the fundus through the pelvis, the tubercle or projecting part of the os tincæ will ſeem larger, longer, and more expanded; but, after this period, it ſhortens, particularly at its fore-parts and ſides, and its orifice or labia begin to ſeparate, ſo as to have its conical appearance deſtroyed. The cervix, which in the early months is nearly ſhut, now begins to ſtretch and to be diſtended to the os tincæ; but during the whole term of utero-geſtation, the mouth of the uterus is ſtrongly cemented with a ropy mucus, which lines it and the cervix, and begins to be diſcharged on the approach of labour. In the laſt week, when the cervix uteri is completely diſtended, the uterine orifice begins to form an elliptical tube, inſtead of a fiſſure or to aſſume the appearance of a ring on a large globe; and often at this time, eſpecially in pendulous bellies, diſappears entirely, ſo as to be out of the reach of the finger in touching. Hence the os uteri is not in the direction of the axis of the womb, as has generally been ſuppoſed.

About the fourth, or between the fourth and fifth month, the fundus uteri begins to riſe above the pubes or brim of the pelvis, and its cervix to be diſtended nearly one third. In the fifth month the belly ſwells like a ball, with the ſkin tenſe, the fundus about half way between the pubes and navel, and the neck one half diſtended. After the ſixth month the greateſt part of the cervix uteri dilates, ſo as to make almoſt one cavity with the fundus. In the ſeventh month the fundus advances as far as the umbilicus. In the eighth it reaches mid way between the navel and ſcrobiculus cordis; and in the ninth to the ſcrobiculus itſelf, the neck then being entirely diſtended, which, with the os tincæ, become the weakeſt part of the uterus. Thus at full time the uterus occupies all the umbilical and hypogaſtric regions; its ſhape is almoſt pyriform, that is, more rounded above than below, and having a ſtricture on that part which is ſurrounded by the brim of the pelvis.

The appendages of the uterus ſuffer very little change during pregnancy, except the ligamenta lata, which diminiſh in breadth as the uterus enlarges, and at full time are almoſt entirely obliterated.

The moſt remarkable change happens in the ovarium. A cicatrice of a roundiſh figure and yellowiſh colour appears in this body, called by anatomiſts the *corpus luteum*. It is always to be found in one of the ovaria; and in caſes of twins a corpus luteum often appears in both ovaria. It was formerly conſidered as the calyx ovi; but modern phyſiologiſts think it a gland, from whence the ſeminal fluid is ejected. In early geſtation it is moſt conſpicuous, when a cavity is obſervable, which afterwards collapſes; no veſſels appear at the centre of this cavity which has the appearance of cicatrix, but all around that centre the ſubſtance is vaſcular.

During the progreſs of diſtenſion, the ſubſtance of the uterus becomes much looſer, of a ſofter texture, and more vaſcular than before conception; its veins particularly, in their diameters, being enlarged in ſuch a manner as to get the name of *ſinuſes*; they obſerve a more direct courſe than the arteries, which run in a ſerpentine manner, anaſtomoſing with one another and through its whole ſubſtance, eſpecially where the placenta adheres, where this vaſcular appearance is moſt conſpicuous.

The arteries paſs from the uterus through the decidua, and open into the ſubſtance of the placenta in a ſlanting direction. The veins alſo open into the placenta, and by injecting theſe veins from the uterus with wax, the whole ſpungy or cellular part of the placenta will be filled.

The muſcular ſtructure of the gravid uterus is extremely difficult to be ſhown; in the wombs of women who die in labour, or ſoon after delivery, fibres running in various directions are obſervable more or leſs circular, that ſeem to ariſe from three diſtinct origins; viz. from the place where the placenta adheres, and from the aperture or orifice of each of the tubes; but it is a moſt impoſſible to demonſtrate regular plans of fibres, continued any length without interruption.

Chap. III. *Spurious Gravidity.*

The various diſeaſes incident to the uterine ſyſtem, and other morbid affections of the abdominal viſcera, will frequently excite the ſymptoms and aſſume the appearance of utero geſtation. Complaints ariſing from a ſimple obſtruction are ſometimes miſtaken for thoſe of breeding; when a tumor about the region of the uterus is alſo formed, and gradually becomes more and more bulky, the ſymptoms it occaſions are ſo ſtrongly marked, and the reſemblance to pregnancy ſo very ſtriking, that the ignorant patient is often deceived, and even the experienced phyſician impoſed on.

Scirrhous, polypous, or ſarcomatous tumors in or about the uterus or pelvis; dropſy or ventoſity of the uterus or tubes; ſteatoma or dropſy of the ovaria, and ventral conception, are the common cauſes of ſuch fallacious appearances. In many of theſe caſes the menſes diſappear; nauſea, retchings, and other ſymptoms of breeding, enſue; flatus in the bowels will be miſtaken for the motion of the child; and in the advanced ſtages of the diſeaſe, from the preſſure of the ſwelling on the adjacent parts. Tumefaction and hardneſs of the mammæ supervene, and ſometimes a viſcid or ſerous fluid diſtils from the nipple; circumſtances that ſtrongly confirm the woman in her opinion, till time or the dreadful conſequences that often enſue at laſt convince her of her fatal miſtake.

Falſe Conception.—Mola. Other kinds of ſpurious gravidity, leſs hazardous in their nature than any of the preceding, may under this head alſo be claſſed; diſeaſes commonly known by the names of *falſe conception* and *mola:* The former of theſe is nothing more than the diſſolution of the fœtus in the early months; the placenta is afterwards retained in the uterus, and from the addition of coagula, or in conſequence of diſeaſe, is excluded in an indurated or enlarged ſtate; when it remained for months or longer, and came off in the form of a fleſhy or ſcirrhous-like maſs, without having any cavity in the centre, it was formerly diſtinguiſhed by the name of *mola*.

Mere coagula of blood, retained in the uterus after delivery, or after immoderate floodings at any period of life, and ſqueezed, by the preſſure of the uterus, into a fibrous or compact form, conſtitute another ſpecies of mola, that more frequently occurs than any of the former. Theſe, though they may aſſume the appearances of gravidity, are generally, however, expelled ſpontaneouſly, and are ſeldom followed with dangerous conſequences.

CHAP. IV. *Superfœtation.*

SOON after impregnation takes place, the cervix uteri becomes entirely ſhut up by means of a thick viſcid gluten: the internal cavity is alſo lined by the external membrane of the ovum, which attaches itſelf to the whole internal ſurface of the fundus uteri: the Fallopian tubes alſo become flaccid; and are, as gravidity advances, ſuppoſed to be removed at ſuch a diſtance, that they cannot reach the ovaria to receive or convey another ovum into the uterus. For theſe, and other reaſons, the doctrine of *ſuperfœtation* is now pretty generally exploded.—A doctrine that ſeems to have ariſen from the caſe of a double or triple conception, where, ſome time after their formation in utero, one fœtus has been expelled, and another has remained; or after the extinction of life at an early period, one or more may be ſtill retained, and thrown off in a ſmall and putrid ſtate, after the birth of a full-grown child.

The uterus of brutes is divided into different cells; and their ova do not attach themſelves to the uterus ſo early as in the human ſubject, but are ſuppoſed to receive their nouriſhment for ſome time by abſorption. Hence the os uteri does not cloſe immediately after conception; for a bitch will admit a variety of dogs while ſhe is in ſeaſon, and will bring forth puppies of theſe different ſpecies: thus it is common for a grehound to have, in the ſame litter, one of the grehound kind, a pointer, and a third, or more, different from both: Another circumſtance that has given riſe to *ſuperfœtation* in the human ſubject, which can only happen when there is a double ſet of parts, inſtances of which are very rare.

CHAP. V. *Extra-uterine Fœtus, or Ventral Conception.*

THE impregnated ovum, or rudiments of the fœtus, is not always received from the ovarium by the tuba Fallopiana, to be thence conveyed into the cavity of the uterus; for there are inſtances where the fœtus ſometimes remains in the ovarium, and ſometimes even in the tube; or where it drops out of the ovarium, miſſes the tubes, and falls into the cavity of the abdomen, takes root in the neighbouring parts, and is thereby nouriſhed: But as theſe fœtuſes cannot there receive ſo much nouriſhment as in the ſucculent uterus, they are leſs, and generally come to their full growth before the common term.

Of theſe ſome burſt in the abdomen; and others form abſceſſes, and are thereby diſcharged; others dry, and appear bony, and remain during life, or are diſcharged as above, or by ſtool, &c.

CHAP. VI. *Monſters.*

WHEN two or more ova contained in the uterus attach themſelves ſo near one another as to adhere in whole or in part, ſo as to form only one body with membranes and water in common, this body will form a confuſed irregular maſs called *monſtrous*; and thus a monſter may be either defective in its organic parts, or be ſupplied with a ſupernumerary ſet of parts derived from another ovum. This ſeems a rational conjecture; but while every thing relative to generation is a myſtery, how can we account for the extraordinary phænomena? Some authors enumerate a third ſpecies of monſter, the product of a mixed breed, exemplified, for inſtance, in the mule, produced by the mixed generation of an aſs and a mare. In this animal there are organical parts different from what preexiſted in the parents; there is a defect of ſome parts, a luxuriant growth of others; and the defect in the parts of generation, which renders the animal unfit for propagation, conſtitutes a very curious and particular ſpecies.

CHAP. VII. *Diſeaſes of Pregnancy.*

AFTER conception, a remarkable change is ſoon produced in the genital ſyſtem. This is the ſource from whence ariſe different ſymptoms, that are however liable to conſiderable variation, not only in the conſtitution of different women, but in the ſame woman in different pregnancies, and at different periods of the ſame pregnancy.

Outlines of Midwifery, by Dr Hamilton.

Pregnancy,—though a natural alteration of the animal œconomy, which every female ſeems originally formed to undergo, and hence not to be conſidered as a ſtate of diſeaſe, occaſions, however, ſooner or later, in many women, various complaints, which evidently depend on it as a cauſe.

Diſeaſes incident to the pregnant ſtate may be conſidered, either, 1. As ariſing from ſympathy in the early months; or, 2. As depending on the ſtretching and preſſure of the uterus towards the more advanced ſtages.

I. Though

Diſeaſes of Pregnancy.

I. Though the former of theſe complaints are generally to be accounted for from other cauſes than that of plethora; yet, in many conſtitutions, a certain plethoric diſpoſition in the early months of pregnancy ſeems to prevail in the vaſcular ſyſtem: And therefore, though many inconveniences may enſue from a too frequent, a too copious, or an indiſcriminate uſe of veneſection; yet if prudently and judiciouſly employed, abortion by this means will not be endangered, as ſome late authors have alledged; but on the contrary, on many occaſions, a ſeaſonable bleeding will be attended with the moſt beneficial and ſalutary effects.

In young women, ſuddenly affected with ſevere ſickneſs and loathing, febrile commotion, headach, vertigo, and other ſymptoms of breeding, more eſpecially in full ſanguineous habits, beſides a ſpare light diet and ſuitable exerciſe, recourſe muſt be had to proper evacuations, the chief of which is veneſection: this may be ſafely performed at any time of gravidation, and occaſionally repeated according to the urgency of the ſymptoms; ſmall bleedings, at proper intervals, are preferable to copious evacuations, which in early pregnancy ought always to be carefully guarded againſt.

When the ſtomach is loaded with putrid bile or acrid ſaburra, the offenſive matter ſhould be diſcharged by gentle vomits of ipecacuan, or of infuſions of chamomile flowers. The violent efforts to retch and vomit, and the commotions thence excited, which often occaſion the expulſion of the fœtus, will by this means frequently be removed, in moſt caſes greatly diminiſhed. During the term of breeding, the ſtate of the belly muſt be alſo attended to. When laxative medicines become neceſſary, thoſe of the mildeſt and gentleſt kind ſhould be adminiſtered.

In women liable to nervous complaints, where the ſtomach is weak, and the ſickneſs violent and continued, the patient ſhould be put on a courſe of light, aromatic, and ſtrengthening bitters ſuch as infuſions of bark, columbo, &c. and her diet, air, exerciſe, company, and amuſement, ſhould be regulated in order to ſettle the ſtomach, and leſſen the ſenſibility of the ſyſtem, opiates will often happily ſucceed, when every other remedy fails.

Heart burn and *diarrhœa*,—common ſymptoms of breeding, or of pregnancy, muſt be treated pretty much as at other times. Both complaints chiefly depend on the ſtate of the ſtomach.

Tumefaction, tenſion, and *pains* in the *mammæ*—If tight lacing here be only avoided, and the breaſts have room to enlarge and ſwell, no inconvenience ever follows: Theſe effects ariſe from a natural cauſe, and ſeldom require medical treatment. If very troubleſome and uneaſy, bathing with oil, or anointing with pomatum, and covering with ſoft flannel or fur, will in moſt caſes prove the cure.

The *menſtrual evacuation*—is in ſome women regular for the firſt, ſecond, or third period after conception. This ſeldom happens but in women of ſanguinary plethoric habits, ſuch as have been accuſtomed to large copious evacuations at other times when the diſcharge is to be conſidered as beneficial.

Deliquia, nervous, or *hyſteric fits*—When theſe are occaſioned by falls, frights, and paſſions of the mind, they frequently end in the loſs of the child: But when they happen about the term of quickening, they ſeem to ariſe from the eſcape of the uterus from its confinement within the capacity of the pelvis; in which caſe they are commonly ſlight, of ſhort duration, and never threaten any dangerous conſequence.

Diſeaſes of Pregnancy.

II. The ſecond claſs of complaints, viz. thoſe that are incident to the advanced ſtages of utero-geſtation and that depend on the change of ſituation of the gravid uterus, its enlargement and preſſure on the neighbouring parts are more painful in their ſymptoms, and more dangerous in their conſequences, than thoſe enumerated in the preceding claſs. The premature excluſion of the fœtus is generally the worſt inconvenience reſulting from the *one*; the death of the mother, along with the loſs of the child, is too frequently an attendant of the *other*.

Difficulty or *ſuppreſſion* of *urine*—is ſometimes occaſioned by the preſſure of the uterus on the neck of the bladder, before the fundus uteri eſcapes from its confinement within the brim of the pelvis. This complaint, if early attended to, will ſeldom prove troubleſome or hazardous; but cannot be entirely removed till the uterus riſes above the brim of the pelvis, and by its enlargement becomes ſupported by reſting on the expanded bones of the oſſa ilia. But if neglected in the beginning,

A retroverſion of the uterus—is generally the conſequence; a caſe that demands particular attention.—Here the fundus uteri, inſtead of being looſe, falls back in a reclined ſtate within the hollow of the os ſacrum: thus a tumour is formed in the vulva, whereof the os tincæ makes the ſuperior part; the body of the uterus, by this means, becomes ſtrongly wedged between the rectum and bladder; and, from the enlargement of the uterus itſelf, and accumulating load of fæces and urine, the reduction will prove in many inſtances utterly impracticable. A total ſuppreſſion of urine, or a rupture of the coats of the bladder, fever, inflammation, or gangrene of the uterus, often enſue; and theſe are ſucceeded by delirium, convulſions, death.

The indications of cure, in this dangerous diſeaſe, are ſufficiently obvious: For, in the firſt place, every obſtacle that prevents the reduction ſhould be removed: thus the contents of the rectum and bladder muſt, if poſſible, be evacuated; emollient fomentations and cataplaſms muſt be applied, if indicated by inflammation or tumefaction of the parts. Secondly, The reduction of the prolapſed uterus muſt be attempted, by placing the patient upon her knees, with her head low and properly ſupported. While this is attempted within the vagina, a finger or two ſhould alſo be paſſed within the rectum, by which the operation in ſome caſes may be facilitated: but at other times, no power whatever will be ſufficient for this purpoſe. Laſtly, If the reduction be accompliſhed, the fever, inflammatory ſymptoms, and other conſequences of the diſeaſe, muſt be ſubdued; and a recurrence prevented by an open belly, reſt, and recumbent poſture, and promoting a free diſcharge of urine: means that ought to be perſiſted in till the uterus riſes within the abdomen, when the patient will be ſecured from future danger.

Coſtiveneſs

Diſeaſes of Pregnancy.

Coſtiveneſs in pregnancy--is inconvenient. It may proceed from the ſame cauſe with the preceding complaint; it may depend on the ſtomach; the febrile heat, that in many women prevails, will alſo prove an occaſional cauſe. It may be obviated or prevented by a proper regulation of the regimen, and by ſuch gentle laxative medicines as are beſt ſuited to the ſtate of the woman; the chief of which are ripe fruit, magneſia, laxative electuary, cream of tartar, ſulphureous and aloetic medicines, oleum ricini, emollient glyſters.

The piles--frequently ariſe in conſequence of coſtiveneſs, or from preſſure of the gravid uterus on the hæmorrhoidal veins. Theſe are alſo to be removed or palliated by the ſame means employed on other occaſions; regard being had to this diſtinction, which may be applied univerſally to the gravid ſtate, that all violent remedies are to be avoided: a light diet ſhould be enjoined; the belly ſhould be kept moderately open; and topical liniments or cataplaſms ſhould be applied, ſuch as Balſ. ſulphur. Balſ. traumaticum, Liniment. ex ol. palmæ, Ung. ſambucin. cum laud. liquid. Poultices of bread and milk with opium, &c. according to the various circumſtances of the caſe.

Oedematous ſwellings of the legs and *labia*,--are occaſioned by the languid ſtate of the circulation, by the interruption of the refluent blood from the preſſure of the diſtended uterus on the vena cava, &c. Theſe, though very troubleſome and inconvenient, are ſeldom however of dangerous conſequence, except where the habit is otherwiſe diſeaſed; and ſeldom require puncture, as the ſwelling generally ſubſides very quickly after delivery. They can only, therefore, at this time, admit of palliation; for which purpoſe, along with a proper diet and moderate exerciſe, a frequent recumbent poſture, open belly, and dry frictions applied to the legs evening and morning, will prove the moſt effectual means.

Varicous ſwellings in the legs and thighs--from the interruption of the venal blood in theſe parts, occaſioned by the preſſure of the gravid uterus, are to be treated in the ſame manner with the preceding complaint.

Pains in the back, loins, cholic-pains, cramp,--occaſioned by the ſtretching of the uterus and appendages, and from the preſſure of the uterus on the neighbouring parts, ſymptoms that are moſt troubleſome in a firſt pregnancy, are to be palliated by veneſection, an open belly, and light ſpare diet. If the patient be of a full habit, and pre-diſpoſed to inflammatory complaints, where the preſſure is very great in the advanced months, or in twins, &c. if proper remedies are neglected, inflammation of the uterus and adjacent viſcera, or dreadful epileptic fits, may quickly enſue; the event whereof is generally fatal. Crampiſh ſpaſms in the belly and legs require the ſame palliative treatment; to which may be added friction, and the application of æther, ol. volatil. balſ. anodyn. or the like, to the parts affected.

Cough, dyſpnæa, vomitings, difficulty or incontinency of urine, occaſioned by the preſſure of the bulky uterus on the ſtomach, liver, diaphragm, &c.---Complaints that can only be alleviated by frequent ſmall bleedings, a light ſpare diet, and open belly. The patient ſhould be placed in an eaſy poſture, ſomething between ſitting and lying; and when the uterus riſes high, a moderate degree of preſſure from the ſuperior part downwards, may in ſome caſes prove uſeful. But this muſt be uſed with great caution: for dreadful are the effects of violent preſſure, or tight lacing, during pregnancy. It frequently kills both mother and child, and ought to be guarded from the earlieſt months.

Diſeaſes of Pregnancy.

Epileptic fits,--are a very dreadful and alarming appearance. They generally depend upon the ſame cauſe with the above complaints: they may alſo ariſe from irritation, excited by the motion and ſtirring of the fœtus; and from various other cauſes. Such as have had convulſions when young, are moſt liable to have them during pregnancy: they happen moſt frequently in firſt pregnancies, or where the fœtus is very large, or in twins, triplets, &c. In ſuch caſes, the diſtention of the uterine fibres is ſo great, that actual laceration is ſometimes the conſequence.

At whatever period of pregnancy they ſeize, the utmoſt danger may be dreaded. This, however, will be in proportion to the ſeverity, duration, and recurrence of the paroxyſm, to the term of gravidation, to the conſtitution of the patient, and her condition during the remiſſion. The danger is greater towards the latter end of pregnancy than in the earlier months or in time of labour.

Such as ariſe from inanition, from exceſſive and profuſe hæmorrhagies, from violent blows, falls, &c. or from a ruptured uterus, are for the moſt part fatal.

Hyſteric or nervous ſpaſms muſt be carefully diſtinguiſhed from true epileptic fits. The former are milder than the latter; they are not attended with foamings; they do not affect the poſture; the pulſe is ſmaller, feebler, and more frequent; the woman is pretty hearty after they are over; they are followed with no bad conſequences, and yield to the common treatment. Women of ſtrong, robuſt, vigorous conſtitutions, are more generally the ſubjects of the *one;* the delicate, the nervous, and the irritable, of the *other*.

Epileptic fits generally come on very rapidly; if any previous ſymptoms occur, the fit is commonly announced by an intenſe pain in the ſcrobiculum cordis, or violent head-ach.

In the pregnant ſtate, theſe fits are for the moſt part ſymptomatic, and will therefore only admit of a palliative cure. They may be diſtinguiſhed into three claſſes; thoſe of the early months, thoſe of the latter, and thoſe that come on with labour-pains.

With regard to the cure, the term of pregnancy, as well as the conſtitution of the patient, and particular cauſe of the diſeaſe, muſt carefully be conſidered.

1. Convulſions at an early period of pregnancy chiefly happen to young women of a plethoric ſanguine habit; and can therefore only be removed or palliated by a free and bold uſe of the lancet, by an open belly, cold regimen, and ſpare diet. After plentiful evacuations, if the ſtomach be loaded with acrid ſaburra or putrid bile, a gentle puke may be of uſe: but ſuch remedies, on thoſe occaſions, muſt be employed with great caution. Inſtead of a plethoric, if the patient is of a nervous habit, a very neceſſary and important diſtinction, the intentions of cure will eſſentially vary. For here opiates in large doſes and frequently repeated, emollient glyſters, ſtupes applied to the legs, the ſemicupium, and every other means to ſoothe the nerves and remove ſpaſmodic ſtricture, will prove the moſt effectual remedies. If inſenſible

Diseases.

or comatous, opium, muſk, and other antiſpaſmodics, ſhould be exhibited by way of glyſter, and the patient ought to be rouſed by epiſpaſtic and ſtimulating cataplaſms applied to the legs and hams. Convulſions ſucceeding profuſe evacuations are generally mortal. The vis vitæ, in ſuch circumſtances, muſt be ſupported, by repleniſhing the veſſels with the utmoſt ſpeed: this is to be done by pouring in nouriſhing fluids as faſt as poſſible by the mouth and by glyſter; warm applications ſhould alſo be made to the ſtomach and feet, and nervous cordials given internally along with opium.

The treatment of epileptic fits, depending on other cauſes than thoſe now mentioned, muſt be regulated by a proper attention to the particular ſymptoms with which they are attended.

2. In the advanced months, ſuch complaints are more to be dreaded than in early geſtation, as they generally proceed from the irritation occaſioned by the diſtention of the uterine fibres, or by the preſſure of the uterus on the contiguous viſcera: hence the natural functions of theſe parts will be interrupted, the circulation of their fluids will be impeded, and the blood, being thus prevented from deſcending to the inferior parts, will be derived in greater proportion to the brain, and overcharge that organ.

The cure muſt, in this caſe, chiefly reſt on copious and repeated bleedings, an open belly, and ſpare diet.

3. Laſtly, when fits come on with labour-pains, a ſpeedy delivery, if it can be done with ſafety, either by turning the child, or by extracting with the forceps when the head is within reach, will prove the moſt effectual cure.

When the bladder is diſtended, the contents muſt be evacuated: if a ſtone ſticks in the urethra, it muſt be puſhed back or extracted. If the fits are the effects of a ruptured uterus, immediate death is generally the conſequence.

With regard to the treatment of ſuch complaints, no other change is generally requiſite, than what ariſes from the ſymptoms peculiar to this ſituation. In general, till after delivery, they will only admit of palliation.

Chap. VIII. *Floodings.*

These, though confined to no particular term, may happen at every period of gravidation. The one is a frequent conſequence of the other; the event of both is often hazardous, as the earlier miſcarriages are generally preceded by an effuſion of blood from the uterus, which, in the advanced ſtages of pregnancy, beſides the loſs of the child, always endangers the life of the mother.

The *menorrhagia gravidarum*—may be defined, an effuſion of blood from the uterus, confined to no regular or ſtated periods, in quantity and duration various, and liable to recur on the ſlighteſt occaſions.

The immediate cauſe is, a ſeparation of ſome portion of the placenta or chorion from the internal ſurface of the uterus. Whatever occaſions this ſeparation may be conſidered as the remote cauſe, which, though various, may be reduced to

I. Thoſe that affect the general ſyſtem; as,

1. External accidents changing the ſtate of the circulation.
2. Changes in the circulation from internal cauſes.
3. Debility.
4. Plethora.

II. Thoſe that affect the uterus and placenta: as,

1. Direct affections.
2. Stimuli communicated from an affection of other parts.

With regard to the cure.—Though a flooding in ſome conſtitutions may happen, even in early geſtation, and may remit and recur from time to time, and the woman go on to the end of her reckoning; and tho' it ſeldom or never happens that this complaint proves mortal to the mother in the firſt five weeks of pregnancy; yet every appearance of this kind, even the ſlighteſt, is to be dreaded; as in the early months it will often throw off the fœtus, and, in the latter, always threatens the utmoſt danger both to mother and child. Floodings of gravid women we cannot propoſe radically to cure; they will only admit of palliation. With this view, the indications are,

I. To leſſen the force and velocity of the blood in general.

II. To promote the conſtriction of the patulous mouths of the bleeding veſſels, or the formation of coagula in their orifices.

1. To anſwer the firſt indication, reſt and a recumbent poſture, cool air, tranquillity of mind, a light diet, veneſection, and opiates, are the chief means.

2. To reſtrain the violence of the hemorrhagy, internal aſtringent medicines are recommended; but this is to be accompliſhed chiefly by means of cold ſtyptic applications to the parts and their neighbourhood. But as theſe floodings often ariſe from ſo various and oppoſite cauſes, it is difficult to lay down particular indications, or to point out a method of cure ſuited to every caſe that may occur. The intention of cure can only be regulated by a careful and judicious conſideration of the cauſe, and of thoſe particular circumſtances with which the caſe may be attended. In early pregnancy, it may be reſtrained by keeping the patient quiet and cool, by giving internally cooling things and opiates; but, in the advanced ſtages, the deluge is ſometimes ſo profuſe as to kill very ſuddenly. Under ſuch circumſtances, when the woman is near her time, emptying the uterus by delivery, if practicable, is the only ſafe expedient both for preſerving the life of the mother and of the child.

If the hemorrhagy can be reſtrained, a recurrence muſt be guarded againſt, by avoiding or counteracting the occaſional or remote cauſes.

Abortion.

Chap. IX. *Abortion, or Miſcarriage,*

May be defined, the premature expulſion of the embryo or fœtus. Some, however, make the following diſtinction: When a woman miſcarries in early geſtation, this they conſider as an abortion; but if in the latter months, that they term a *premature birth.* The ſymptoms that threaten abortion are:

Flooding.

Pain in the back and belly.

Bearing down pains with regular intermiſſions.

The evacuation of the waters.

The death of the child, which diſcovers itſelf by the following ſymptoms; though in general theſe are ſo doubtful and fallacious, that none of them afford an infallible ſign:

1. The ſubſiding of the abdominal tumor.
2. Ceſſation of motion in the fœtus.
3. The ſenſation of a heavy weight falling from ſide to ſide, as the woman turns herſelf in bed.
4. Sickneſs, faintings, rigors, cold ſweats.
5. The breaſts turning flaccid.
6. Coldneſs of the abdomen, and putrid diſcharge from the vagina.

Abortions are ſeldom dangerous in the firſt five months; but a frequent habit of miſcarriage debilitates the ſyſtem, ſhatters the conſtitution, and lays the foundation of chronic diſeaſes of the moſt obſtinate and dangerous nature.

In the advanced months, the prognoſis will be more or leſs favourable according to the patient's former ſtate of health, the occaſional cauſe, and ſymptoms with which it is attended. The proximate cauſe of abortion is the ſame with that of true labour, *viz.* a contracting effort of the uterus and abdominal muſcles, aſſiſted by the other expulſive powers. The remote cauſes cannot be explained with preciſion; as many circumſtances, with regard to the nature of impregnation, and connection of the fœtus with the placenta and uterus, are ſubjects ſtill involved in darkneſs. They may in general, however, be reduced,

I. To whatever interrupts the regular circulation between the uterus and placenta.

II. To every cauſe that excites the ſpaſmodic contraction of the uterus, or other aſſiſting powers.

III. To whatever occaſions the extinction of life in the fœtus.

Amongſt the firſt are:

1. Diſeaſes of the uterus.
2. Imperviouſneſs or ſpaſmodic conſtriction of the extremities of the uterine blood veſſels.
3. Partial or total ſeparation of the placenta or chorion from the uterus.
4. Determination to other parts.

To the ſecond general head belong all cauſes that produce a ſtrong contraction of the elaſtic fibres of the uterus, or of the parts that can preſs upon it, or that occaſion a rupture of the membranes: ſuch as,

1. Violent agitation of mind or body.
2. A diſeaſe of the membranes.
3. Too large a quantity of liquor amnii.
4. The croſs poſition of the fœtus.
5. Its motion and kicking.

The laſt head includes the numerous cauſes of the death of the child, which, beſides thoſe referred to in the preceding claſſes, may be occaſioned by,

1. Diſeaſes peculiar to itſelf.
2. Diſeaſes communicated by the parents.
3. External accidents happening to the mother: or,
4. Accidents incident to the fœtus in utero.
5. Diſeaſes of placenta or funis.
6. Knots and circumvolutions of the chord.
7. Too weak an adheſion of placenta or chorion to the uterus: and,
8. Every force that tends to weaken or deſtroy this attachment.

With regard to the treatment. This muſt be varied according to the particular circumſtances of the caſe: nor is it poſſible to point out particular indications, or propoſe any regular plan to be purſued for this purpoſe. Abortion is often preceded by no apparent ſymptom, till the rupture of the membranes, and evacuation of the waters, announce the approaching expulſion of the fœtus. Either to remove threatening ſymptoms, or to prevent miſcarriage when there is reaſon to apprehend it, often baffles our utmoſt ſkill; becauſe it generally happens, that there is a ceſſation of growth in the ovum; or in other words, an extinction of life in the fœtus, ſome time previous to any appearance of abortion. For inſtance, in early geſtation, a woman commonly miſcarries about the 11th or 12th week; but the age of the fœtus at this time is generally no more than eight weeks. At other times, when by accident the fœtus periſhes, perhaps about the fifth or ſixth month, it will ſtill be retained in utero, and the expulſion will not happen till near the completion of full time.

As women who have once abſorbed are ſo liable to a recurrence from a like cauſe, at the ſame particular period, ſuch an accident, in future pregnancies, ſhould therefore be guarded againſt with the utmoſt caution. On the firſt appearance of threatening ſymptoms, the patient ſhould be confined to a horizontal poſture; her diet ſhould be light and cooling; her mind ſhould be kept as tranquil as poſſible; a little blood from the arm may be taken occaſionally; and opiates adminiſtered according to circumſtances: but excepting ſo far as depends on theſe, and ſuch like precautions, for the moſt part, in the way of medicine, very little can be done.

Manual aſſiſtance is ſeldom or never neceſſary during the firſt five months of pregnancy: the excluſion of fœtus and placenta ſhould very generally be truſted to nature.

The medical treatment of abortion muſt therefore be conſidered with a view only to the prophylactic cure: and this again will chiefly conſiſt in a proper

Chap. X. *Regimen during Pregnancy.*

Women, when pregnant, ſhould live a regular temperate life; moderation in eating and drinking ſhould now be very carefully obſerved, and every thing that has any tendency to diſagree with the ſtomach ſhould be avoided; otherwiſe the manner of life ſhould be much as uſual. If complaints do occur, theſe ſhould be treated as at other times; only guarding againſt ſuch things as, by violent operation, many endanger miſcarriage. If the woman has formerly been ſubject to this accident, the cauſe ſhould be carefully conſidered, and ſuitable remedies applied; if plethoric, for inſtance, ſhe ſhould be blooded, live ſparingly, and kept quiet, till ſhe gets beyond the dangerous period. If ſhe be weak, delicate, and nervous, bark, light aromatic bitters, mineral waters, and the cold bath (if able to bear it) will prove the beſt prophylactic remedies. The cold bath has, in many caſes, cured the moſt obſtinate fluor albus, and ſometimes even ſterility itſelf; and, in relaxed habits diſpoſed to miſcarriage, when every other

Regimen.

Regimen.

means has failed, the cold bath has done conſiderable ſervice: the practice may ſafely be continued for ſome months after conception, when it has been early begun, or when the patient has been accuſtomed to it. Such a ſhock will, however, act very differently on different ſyſtems: hence it is an expedient by no means to be indiſcriminately uſed in the pregnant ſtate.

Abortions that happen in early geſtation, and that come on ſuddenly without any preſaging ſign, if ever they are to be prevented, it can only be done by avoiding all occaſional cauſes, by counteracting morbific diſpoſitions, and by confinement to a horizontal poſture, for ſome time before, and till the critical period be over.

When a venereal taint in the parents is ſuſpected to be the cauſe either of abortion or the death of the fœtus, the like accident can only be prevented by putting both parties on a mercurial courſe.

Pregnant women require a free pure air; their amuſement ſhould often be varied; their company ſhould be agreeable and cheerful; their exerciſe ſhould be moderate, and ſuited to their inclination, conſtitution, and the ſeaſon; they ſhould avoid crowds, confinement, travelling over rough roads in a carriage, or being expoſed to ſea-voyages. Riding a-horſeback ſhould alſo be practiſed with great caution, that diſagreeable objects may be ſhunned, and ſhocks of every kind prevented. For this reaſon, when riding is judged proper, the woman ſhould be a courageous rider; ſhe ſhould never ride without ſomebody being in company; the horſe ſhould be tame and well trained; the road ſhould be ſmooth as well as private; and the exerciſe ſhould be gentle and eaſy, and never carried the length of fatigue. Women ſhould with the utmoſt care, guard againſt confining the breaſts or belly; early recourſe ſhould be had to jumps, and they ſhould keep themſelves as looſe and eaſy as poſſible through the whole term of utero-geſtation. An open belly is neceſſary and important in the pregnant ſtate; it keeps the ſtomach in good condition, prevents cholics and other complaints that may terminate in miſcarriage. When the abdomen is pendulous towards the latter months, a gentle ſupport by proper bandage will prove uſeful; and the woman, when fatigued, ſhould occaſionally, through the day, indulge in reſt on a bed or couch.

PART II. OF LABOURS.

LABOURS are divided into three claſſes: *natural, laborious*, and *preternatural*.

In whatever manner the head of the child preſents, where the delivery at full time is performed by nature, the labour is with great propriety called *natural*; when the birth is protracted beyond the uſual time, or cannot be accompliſhed without extraordinary aſſiſtance, it is deemed *laborious*; and *preternatural*, when any other part but the head preſents.

CHAP I. *Natural Labour.*

BY whatever power the uterus is enlarged, when any further increaſe is prevented, a ſtimulus to contraction muſt enſue: by this means an uneaſy ſenſation is excited, which muſt, in the woman produce an effort to procure relief; and thus ariſe the true labour-pains, which at firſt are ſlight and of ſhort duration, a conſiderable remiſſion intervening: the periods of recurrence ſoon become more frequent; the pains acquire an increaſed force, producing more and more change on the os uteri; which, yielding to the impelling cauſes, gradually opens and expands; till at length it becomes completely dilated, the membrane protruded and ruptured, and the child, by the expulſive force of the uterus, aſſiſted by that of the diaphragm and abdominal muſcles, is thus puſhed along and delivered.

The ſymptoms of approaching labour are, The ſubſiding of the abdominal tumour: hence a diſcharge of mucus from the vagina, ſometimes tinged with blood; incontinency, or ſuppreſſion of urine: teneſmus; pains of the belly, loins, and about the region of the pubes; reſtleſneſs, hot and cold fits, &c.

Spurious pains are to be carefully diſtinguiſhed from thoſe of genuine labour. The former ariſe from the ſtretching of the uterus and its preſſure on the neighbouring parts, or from coſtiveneſs; and are to be diſtinguiſhed from the latter by the following ſymptoms: They are moſt troubleſome towards the evening, increaſe in the night, and abate through the day; they are more trifling and irregular than true uterine pains; the uterine orifice is not affected and there is no increaſed flow of mucus from the parts.

True pains begin about the region of the kidneys, ſtrike forward towards the pubes, and down the thighs: they return at regular periods: there is a copious diſcharge of mucus from the vagina; the os uteri gradually opens, and can be felt to dilate in time of a pain; while the membraneous bag, in a tenſe ſtate, forcibly puſhes againſt the finger.

The event of labours is ſo precarious, that no certain judgment can be formed from almoſt any ſymptoms, till the labour itſelf be conſiderably advanced. A prognoſis in general is chiefly to be formed from the age, ſtate of health, and temperament of the patient; from the force, duration, and recurrence of the pains; and from their effect on the uterine orifice; from the time of the rupture of the membranes; from the general make and form of the woman, but, in particular of that of the pelvis; from the bulk and poſition of the child, &c.

With regard to the method of delivery, and poſition of the woman, this has been different at different ages and in different countries: the chief thing, however, is to guard againſt cold and fatigue, obſerving that the woman be placed in the moſt favourable poſture for ſupporting the back, for the action of the abdominal muſcles, &c. and moſt convenient for the neceſſary aſſiſtants: till the labour is conſiderably advanced, ſhe may be indulged in whatever poſture is moſt agreeable; after which the bed or couch is the moſt proper.

With regard to aſſiſtance in natural parturition, the accoucheur for the moſt part has little to do, till the membranes are ruptured, and the head in perinæo. In time of labour, the woman ſhould be kept very cool, and every means of being overheated ſhould be avoided. She ſhould be put to bed in proper time, placed on her ſide or back, with her head and ſhoulders a little raiſed, a cloth tied to the bed-poſt, or held by an aſſiſtant, to ſupport her hands in time of pain, and her feet reſting againſt a foot board; her knees ſhould be drawn up towards the belly, and a folded pillow put between them. All efforts to preſs or ſtrain, except what nature excites, are improper, hurtful, and ſhould be avoided; the membranes, if poſſible, ought not to be ruptured till they almoſt protrude at the os externum; the perinæum muſt be lubricated when formed into a tumor, and carefully ſupported while over-ſtretched; for this purpoſe, a cloth ſmoothly folded ſhould be applied over the part, to enable the accoucheur to have a firmer hold. This is an important part of his office; and muſt be attended to with the ſtricteſt care. From the time this protruſion begins to form till the head of the child be completely delivered, the perinæum muſt be carefully preſerved by the palm of the hand firmly applied againſt it, which ſhould be carried backwards in a direction towards the anus, and kept ſo during every pain. Thus the miſerable conſequences will be prevented to which the neglect of this preſſure expoſes; for by this ſupport the over-ſtretching of the perinæum will be greatly leſſened, the parts will dilate gently and gradually, the vertex will eaſily ſlip from under the pubes, and the fore-head will riſe from under the perinæum in a ſafe, ſlow, and gentle manner. The perinæum muſt now be releaſed, by cautiouſly ſliding it over the face and chin of the child; and this ought to be made further ſure of by paſſing a finger under it round and round. After the head has thus mechanically advanced through the pelvis and vagina, a pain or two muſt be waited for, when in like manner the body will follow; nothing more being neceſſary than to ſupport the child while it is gradually puſhed forwards by the expulſive force of the natural pains.

When the child has cried, and the change in the circulation freely taken place, the funis umbilicalis muſt be tied and divided, the infant muſt be wrapped in a warm receiver, and given to the nurſe to be waſhed and dreſſed.

The parts of the woman muſt now be gently wiped, a warm ſoft cloth muſt be applied, and a proper time waited for the ſeparation of the placenta.

This is alſo the work of nature, and ſeldom requires more force to bring it along than if it lay entirely looſe within the cavity of the uterus. Thus in pulling, no greater force ſhould be employed than is juſt ſufficient to put the funis on the ſtretch; for if it is already ſeparated, no violence is neceſſary to extract it; and if the adheſion is very firm, all violent efforts are improper, and often followed with moſt dangerous conſequences. Its advancing is known by the contraction of the uterus, and ſhifting of the abdominal tumor, and by the lengthening of the cord. By the ſpontaneous contraction of the uterus, this ſeparation is effected: the expulſion will be ſlower or more expeditious, according to the ſtate and condition of the woman, according to the number of children ſhe has born, and according to the duration or violence of the labour; it is eaſier and ſooner ſeparated in a firſt birth, when the woman is in good health, and when the labour has been properly managed. In moſt caſes, this ſeparation is accompliſhed within half an hour after the delivery of the child. It adheres moſt firmly after premature births, when the woman has been ſickly during pregnancy, where the labour has been tedious and difficult, or when haſty attempts have been made to extract it. A finger, or finger and thumb, guided by the funis, and introduced within the vagina, to bring down the edge, will remove any difficulty occaſioned by the centre or bulky part paſſing the uterine or vaginal orifice.

When it becomes neceſſary to employ force in extracting the placenta, which is never requiſite but in caſes of flooding, when the woman has been in bad health during pregnancy, when ſhe has ſuffered much in time of labour, or when the ſtring has been torn from it (though the firſt of theſe caſes is perhaps the only one wherein the practice is abſolutely proper), the method of doing it is as follows: In ordinary caſes the woman ſhould be laid on her back or ſide; but when the belly is pendulous, or when the placenta is attached to the fundus uteri, ſhe muſt be placed on her knees, which is the moſt convenient poſture.

The accoucheur, though with a certain degree of courage, yet with the utmoſt poſſible tenderneſs, muſt then paſs his hand well lubricated through the vagina into the uterus, and feel for the convex body of the after-birth; if the chord be entire, this will direct him; if not he muſt feel for the looſe membranes at the edge of the cake, and muſt not be deceived by coagula of blood that lie in the way; if the uterus be conſtricted in the middle like a ſand-glaſs, a circumſtance that ſometimes, though rarely, occurs, this muſt be overcome by a gradual dilatation with one finger after another, till the whole hand in a conical manner can ſafely be paſſed. He muſt not content himſelf with feeling a part; he ſhould be able to move his fingers round the whole body of the cake; the adheſion muſt be ſeparated very gradually, in a direction from the ſides round and round. The placenta is diſtinguiſhed from the uterus, as well by its ſoftneſs as by its convex puckered feel. This convexity increaſes in the ſame proportion as the uterus contracts; hence the middle part or centre of the placenta is firſt detached; and if the edges are carefully ſeparated, by gently paſſing the fingers behind, the whole body becomes looſe and diſengaged, which muſt now be brought along with great caution, that no part be left behind, and that no injury be done to the woman in making the extraction.

Though bad conſequences ſometimes follow from the retention of the placenta, yet it is much to be queſtioned, if theſe are not leſs to be dreaded than the dangerous floodings, convulſions, deliquia, inflammation of the uterus, fever, &c. that may be induced from the prepoſterous practice of paſſing the hand to make the extraction: and would it not in general be better to confine the practice of introducing the hand to caſes of uterine hemorrhagies only? Where the adheſion is ſo firm as to require force, or where its place of attachment is out of the reach of the finger, by which, for the moſt part, the edge may be brought down, is it not by far the ſafeſt and the moſt rational practice univerſally to truſt to nature? Should the mouth or body of the uterus become conſtricted before the ſeparation is effected, no matter; little is to be dreaded: it will afterwards kindly dilate; and the ſeparation and expulſion will ſpontaneouſly be accompliſhed with as much ſafety as in other animals, where no force is ever uſed. Let every candid practitioner acknowledge, that for one inſtance where the retention of the placenta has been attended with dangerous conſequences, a precipitate or forcible extraction has proved fatal to hundreds.

After the delivery of child and placenta, the woman muſt reſt a few minutes; her ſtrength and ſpirits may be recruited by ſome light nouriſhing cordial; the wet cloths, &c. muſt then be removed; the bed muſt be properly ſhifted and adjuſted; and a gentle compreſſion muſt be made on the abdomen.

During lying-in, the woman ſhould avoid company and noiſe; her dreſs and bed-linens ſhould be often changed; ſhe ſhould avoid every means of being overheated; and with regard to her diet, it ſhould, for the firſt week at leaſt, be very light and of eaſy digeſtion.

Chap. II. *Laborious or difficult Labour.*

Hamilton's Outlines

When the birth is protracted beyond the ordinary time, or when the child's head though naturally preſenting, cannot be brought forwards without aſſiſtance, the labour is accounted difficult or laborious.

Though the cauſes of laborious births are various and complicated, they may in general be conſidered as depending,

I. On the mother.
II. On the child.
III. On the ſecundines.

I. The birth may be protracted, or the labour-pains interrupted, by,
  (1.) Debility in the mother, ariſing,
    a From diſeaſe, *viz.*
      1. Flooding.
      2. Epileptic fits.
      3. Crampiſh ſpaſms.
      4. Lowneſs and faintiſhneſs.
      5. Inflammatory diatheſis.
      6. Colic.
      7. Nauſeating ſickneſs and vomiting.
      8. Hectic or conſumptive habit.
    b From paſſions of the mind.
    c From miſmanagement in time of labour.
  (2.) Local complaints in the parts, or their neighbourhood, *viz.*
    a In the bones occaſioning narrowneſs, and diſtortion.
    b in the ſoft parts, *viz.*
      1. Dryneſs and conſtriction of the vagina.
      2. Thickneſs and rigidity of the os tincæ.
      3. Scirrhous or polypous tumours about theſe parts.
      4. Accumulated fæces in the inteſtines.
      5. Stone in the urethra.
      6. Prolapſus of the uterus, vagina, and rectum.
      7. Obliquity of the uterus.

II. Difficulties alſo ariſe on the part of the child, *viz.*
  1. From the bulk and oſſification of the head.
  2. The ſituation in which the head preſents.
  3. Large broad ſhoulders, or their tranſverſe deſcent through the pelvis.

III. The ſecundines, *viz.*
  1. The rigidity of the membranes, and the contrary.
  2. Too great a quantity of water.
  3. The funis umbilicalis too long or too ſhort.
  4. The prolapſus of the funis before the child's head: and,
  5. The attachment of the placenta towards the cervix or os uteri.

The treatment of laborious births requires a very nice and careful attention to the condition of the patient and other circumſtances, from whence only we can judge when aſſiſtance becomes requiſite, and how it may be applied to the beſt advantage. That pain and miſery is the unavoidable and inſeparable attendant of child-bearing, though dealt out in different proportions to different ſubjects, the teſtimony of all nations, and all ages, as well as daily experience, bear witneſs: nor is the eaſieſt labour altogether exempted from pain, even under the moſt favourable circumſtances. The delivery, however, promiſes to be ſafe and eaſy, when the woman is of proper age, in good health, the child preſenting right, and the pelvis well proportioned; but the force of the natural pains may be interrupted, and of conſequence labour be retarded from,

I. Debility in the mother, ariſing from
  a Diſeaſe. This may appear under various forms; as,

1ſt, A flooding. Which is very alarming, even along with labour pains: though leſs ſo in this caſe than when at a diſtance from full time; becauſe as the labour-pains increaſe, the hemorrhagy very generally abates: or if not, breaking the membranes when the aperture of the os uteri is ſufficient to admit the hand, ſeldom fails to produce that effect. The woman in this caſe muſt be kept cool. Opiates muſt be adminiſtered; ſhe muſt be comforted with the beſt aſſurances of a happy delivery: and the natural pains muſt be waited for.

But if the hemorrhagy proceeds from a ſeparation of the placenta, attached towards the cervix or orificium uteri, in this unhappy caſe, the whole body of the cake may be completely ſeparated before the aperture of the uterus be ſufficient for allowing the head to paſs; and the deluge may be ſo ſudden and impetuous that the woman will ſink immediately under it. Breaking the membranes and making the delivery, either by turning the child, or extracting with the forceps or crotchet, according to circumſtances, with as much expedition as is conſiſtent with the mother's ſafety, is the only expedient by which the threatning cataſtrophe may be prevented.

2dly, Epileptic fits may in like manner retard labour and endanger the life of the mother. If the child is not thrown off by a few fits, which is often the caſe, the delivery ſhould be effected as ſoon as poſſible.

3dly, Crampiſh ſpaſms in the thighs, legs, rarely in the belly, are very troubleſome. They depend on the preſſure of the head on the nerves as it paſſes through the pelvis, and can only be removed by delivery: which, as theſe pains are ſeldom if ever attended with danger, is not to be forced on this account. Breaking the membranes will ſometimes remove them.

4thly, Lowneſs and faintiſhneſs often occur, and frequently prove the cauſe of protracted labour.

No general rules with regard to the management of ſlow labour can be recommended. The mode of treatment, where ſo many circumſtances may occur, muſt be ſuited to the condition of the patient, as every particular caſe will in ſome meaſure require a different management. Much depends on the prudence and judgment of the attentive practitioner. For inſtance, when the woman is nervous, low-ſpirited, or weakly, from whatever cauſe, in general her ſtrength muſt be ſupported; ſhe muſt not be put on labour too early; ſhe muſt avoid heat, fatigue, and every means of exhauſting her ſtrength or ſpirits. When ſhe is reſtleſs, or the pains trifling and unprofitable, opiates are particularly indicated; they remove ſpurious or grinding pains, recruit the ſpirits, procure reſt, and amuſe time. Little elſe for the moſt part is to be done. If the uterus once begins to dilate, though the dilatation goes on ſlowly, it is by much the beſt and ſafeſt practice to do nothing but regulate the management as above. The pains at laſt will become ſtrong and forcing; and the delivery, even where the patient has been very weakly, will often have a ſafe and happy termination. In theſe tedious labours, if the ſtrength of the woman be properly ſupported, every thing almoſt is to be expected from nature. Forcible means ſhould be the laſt reſource.

5thly, Inflammatory diatheſis, in young ſubjects of ſtrong rigid fibres and plethoric habits, muſt be obviated by veneſection, an open belly, and cooling regimen.

6thly, Colic.—Many women have ſevere attacks of this diſeaſe immediately before the labour-pains come on; the reaſon of which is ſufficiently obvious: the belly, which formerly roſe ſo high that the fundus of the womb preſſed againſt the pit of the ſtomach, afterwards ſubſiding, by the child's ſinking to the lower part of the womb, and the oval of the head being applied to the oval of the baſin, the contents of the inteſtines will be forced lower and lower, and the ſtraight gut will be diſtended. Hence colic-pains, irritation, and uneaſineſs, a frequent deſire to go to ſtool, or frequent looſe ſtools, generally enſue. The beſt palliative remedy is to inject emollient glyſters repeatedly till the bowels be entirely emptied. Although ſome degree of purging ſhould attend the teneſmus, it will be neceſſary to waſh the ſtrait gut, by the uſe of one or more glyſters. The irritating cauſe being in this way removed, an opiate, if no inflammatory heat or fever prevents, may be afterwards given with advantage.

7thly, Nauſeating ſickneſs, with vomiting.—When theſe ſymptoms occur, warm water or chamomile tea muſt be drunk freely. Sickneſs and vomiting happen in ſome degree in the eaſieſt labours. Sometimes they proceed from a diſordered ſtate of the ſtomach; but in general are to be accounted for from the well-known ſympathy of the womb with the ſtomach; and accompany the ſtretching of the os uteri only.

8thly, Hectic or conſumptive habit.—It is a melancholy thing to attend a labouring woman in this ſtate. The pains are weak and trifling; ſhe cannot force much down; and ſhe is feeble, and liable to faint when the pain goes off. But however apparently exhauſted, the progreſs of labour goes on, in moſt caſes, much better than could be well expected. The orifice of the womb gives little reſiſtance to the force of the pains, weak and trifling as they are; the parts are ſoft and lax, and ſoon ſtretch in ſuch a manner, that, if there be no fault in the pelvis, the child readily obtains a paſſage.

Here little is to be done but ſupplying the patient from time to time with light nouriſhment; with cordials that do not heat: and keeping up a free circulation of cool air all around her: for this purpoſe the curtains ſhould be quite drawn aſide, doors and windows widely opened; and ſhe ſhould be placed in a poſition with her head and breaſt well raiſed, that an eaſy reſpiration may be promoted. Hectic women under proper management rarely ſink immediately after delivery; they generally ſurvive a week or longer, tho' they ſeldom outlive the month.

b. Paſſions of the mind. Any piece of news in which the patient, her family, or relations are intereſted, ſhould be carefully concealed, as well as every thing that tends in general to affect the paſſions; as labour may not only be interrupted from this cauſe, but the moſt dangerous ſymptoms, as floodings, convulſions, deliquia, and fatal ſyncope, may be induced.

c. From miſmanagement in time of labour often ariſes debility; ſo that the patient's ſtrength is exhauſted, the pains at length entirely ceaſe, and the head of the child remains locked in the pelvis, merely from want of force or pain to puſh it forwards. In all caſes where the labour has the appearance of being tedious, the woman's patience muſt, as much as poſſible, be ſupported. During the grinding pains, ſhe muſt be kept cool and quiet: opiates may be exhibited to paſs the time, till the forcing throes enſue, when ſhe will acquire reſolution, the parts will dilate kindly, and the labour end happily; whereas, if ſhe conſiders herſelf in labour from the earlieſt appearance of grinding pains, ſhe is frightened at the length of time, and her patience runs out. Slow lingering labours happen chiefly to elderly women having a rigidity in the parts, to nervous ſubjects, and to ſuch as have been weakly during pregnancy. It is of great conſequence, and the advice cannot be too much inculcated, to avoid exhauſting the woman's ſtrength too much at firſt.

2. *Local complaints in the parts, or their neighbourhood.*

a. Narrowneſs or diſtortion of the bones of the pelvis. Where there is any material defect in this cavity, a ſuperficial knowledge of the form and ſtructure of the parts will enable us to judge. If, from the figure of the woman's body, there is reaſon to ſuſpect a faulty pelvis; if the ſpine is twiſted, the legs crooked, the breaſt-bone raiſed, or the cheſt narrow; whether the pelvis be affected or not, ſhe will require a particular management; for the conſtitution of ſuch women is weak and feeble, and they cannot be much confined to bed on account of their breathing. We can never be abſolutely certain of a diſtortion of the pelvis (except when the diſtortion is confined to the inferior aperture) till the uterine orifice is conſiderably dilated. After this time, if the pains are ſtrong and forcible, and the head of the child makes no advance, a narrow pelvis or large head is to be ſuſpected. The pelvis may be faulty at the brim, bottom, or in the cavity or capacity. The firſt of theſe, which moſt frequently occurs, is the moſt difficult to be diſcovered. The ſecond can be readily perceived by the touch: for we can feel the defects in the ſhape of the os ſacrum and coccyx, in the poſition of the iſchia, and in the bending of the pubes; and where the diſtortion is ſo general, that the whole cavity of the pelvis is affected, the ſhape of the woman's body, the ſlow progreſs of the labour, and the ſtate of the parts to the touch, will afford ſufficient information

In the firſt caſe, we can only know the diſtortion by the ſymptoms; for we ſhould not attempt to introduce the hand till the mouth of the womb be dilated: it is afterwards unneceſſary; for we know that the pelvis is too ſmall, or the head too large, by its not advancing in proportion to the pains, and by feeling a ſharp ridge like a ſow's back on the top of the child's head, which is occaſioned by the bones riſing over each other in conſequence of the preſſure.

How long nature, in ſuch circumſtances, can ſupport the conflict, it is difficult to ſay. It is ſufficient to obſerve, that when things are properly prepared for the advance of the child, when the firſt ſtage of the labour is accompliſhed, but its progreſs is then ſuſpended, it is of little conſequence to the midwife whether the obſtacle is to be referred to the child or to the mother; and a man-midwife ought to be immediately called in.

If the patient's ſtrength declines; if the head, from being locked in the bones of the pelvis, begins to ſwell, and the parts of the woman to be affected with tumefaction and inflammation; nature, in this caſe, ſeems inſufficient, and it will be dangerous longer to delay the proper means of making the delivery; as mother or child, or both, may fall a victim to our neglect. We muſt not, however, allow ourſelves to be impoſed on, either by the impatience of the diſtreſſed mother, or by the clamours of the officious impertinents about her. In affording that aſſiſtance we are able to give, we are only to be directed by the ſymptoms of the caſe: we muſt remember, that the gentleſt aſſiſtance our hands or inſtruments in laborious births can afford, is always attended with hazard and riſk; that if inſtruments be applied too early, nature will be thus interrupted in her work, and the moſt fatal conſequences may enſue; and that if aſſiſtance be delayed too long, the mother may die undelivered: we ought, however, to be informed, that the former practice of having too early recourſe to forcible means, where, in time, nature unaſſiſted might do her buſineſs, has proved by far more fatal than the latter. We ought therefore carefully to conſider the general hiſtory of the patient, and particular circumſtances of the caſe, that we may hit the proper time of making the delivery; which, in theſe laborious labours, is exceedingly difficult to determine; yet is a matter of the utmoſt importance, as there is always one, often two or more lives at ſtake, and the accoucheur is accountable for the conſequences of his miſconduct or neglect.

b. The fault may be in the ſoft parts: as,

1. Dryneſs and conſtriction of the vagina. Here all ſtretching and ſcooping is to be avoided. The natural moiſture is to be ſuppplied by lubricating with pomatum or butter, or by throwing up injections of warm oil; the parts are likewiſe to be relaxed by the application of warm ſtupes, or by warm ſteams directed to them.

2. Thickneſs and rigidity of the os tincæ. This happens chiefly in women well advanced in life, where the parts open more ſlowly, and the labour generally proves more tedious. Here alſo little is to be done but waiting on with patience, comforting the woman as well as poſſible, and giving an opiate from time to time. The parts may be relaxed with butter or pomatum, by throwing into the vagina injections of warm oil, or by the application of warm ſtupes to the os externum. Every forcible attempt to open or ſtretch the uterus, as ſome authors preſume to adviſe, is apt to induce inflammation and its conſequences, and to interrupt the natural pains: it is therefore univerſally the ſafeſt practice to truſt in every caſe to theſe; though tedious, or even violent, the labour for the moſt part will end more happily, and the woman recover better, than if force had been employed.

3. Polypous tumors, &c.—There is ſeldom occaſion, in caſe of cicatrices in the vagina, to dilate with the ſcalpel, to remove polypous tumors by exciſion, or to cut upon and extract a ſtone from the urethra in time of labour. But if circumſtances are urgent, ſuch expedients are ſafe and practicable, and warranted by many precedents.

4. Accumulated fæces in the inteſtines ought always to be removed by repeated emollient glyſters on the firſt appearance of approaching labour.

5. A ſtone in the urethra, if it cannot be puſhed back, muſt be cut upon and extracted, as already adviſed.

6. Prolapſus of the uterus may happen even at full time, in a pelvis too wide in all its dimenſions; for which, however, nothing can be done but to ſupport the uterus in time of a pain, that the ſtretching of the parts may be gradual. Prolapſi of the vagina and rectum muſt be reduced at the remiſſion of the pain, and a return by gentle preſſure muſt be prevented.

7. Obliquity of the uterus, though a favourite theory of ſome authors, never happens in ſuch a degree as to influence delivery, except in the caſe of a pendulous abdomen, or where it depends on the make or diſtortion of the pelvis. The firſt of theſe, though it may, by throwing the child's head over the pubes, occaſion perhaps ſome little delay, will ſeldom prove any material obſtacle to the progreſs of the labour.

II. The protraction of labour may depend on the child, and may ariſe from,

1ſt, the bulk or oſſification of the head.

There may be either a natural diſproportion between the head and body, or the ſwelling may be occaſioned by a putrid emphyſema in conſequence of the child's death, or the enlargement may proceed from a hydrocephalus.

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cephalus. The firſt of theſe caſes can only be diſcovered by the ſlow progreſs of the labour, when the pains are ſtrong and frequent, the ſoft parts ſufficiently dilated, the woman in good health, and no other apparent cauſe to account for the remora. The ſecond is diſcovered from the hiſtory of the caſe, from the common ſymptoms of a dead child, *viz* the puffy emphyſematous feel of the preſenting part of the head, and from the ſeparation of the cuticle when touched. Laſtly, the hydrocephalus is diſcovered by the head falling down in the pelvis in a large bulky form, by the bones of the head being ſeparated at conſiderable diſtances, and by a fluctuation evident to the touch. On the whole, however, it may here be obſerved, that the moſt probable or ſuſpicious ſymptoms of the child's death are often deceitful.

From whatever cauſe the head is enlarged, if the difficulty ariſes from this cauſe, and the force of the pains prove ſufficient to puſh the head forwards, recourſe muſt be had to inſtruments; and if the bulk of the head is too large to paſs the diameter of the pelvis, the cranium muſt be opened to diminiſh its ſize, and the brain evacuated previous to the extraction.

2dly, The poſition of the head, which may be ſqueezed into the pelvis in ſuch a manner as not to admit of that compreſſion neceſſary for its paſſing. Such a cauſe of difficulty, however, more ſeldom occurs than many authors have imagined. The raſh and prepoſterous application of inſtruments has, in ſuch caſes, proved the bane of thouſands. Here though the labour will prove more painful and more tedious, yet nature in general, unaſſiſted, will accompliſh her own work with more ſafety to mother and child, than by the intruſion of officious hands. Turning here is always difficult, often dangerous. The ſame obſervation will hold of inſtruments, which ſhould never be employed but when alarming ſymptoms occur: the aſſertion perhaps is not more bold than true, that, in general, the moſt diſadvantageous poſition in which the head can offer is not ſufficient, without ſome other cauſe concurring, either to prevent delivery, or to endanger the life of mother or child ſo much as would be done by the movement of the gentleſt hands. Yet, in ſome caſes, where the woman is weak and exhauſted, and the pains trifling; if the head of the child be large, the bones firm, and the ſutures cloſely connected; or if there be any degree of narrowneſs in the pelvis, a difficult labour is to be expected; and the life of both mother and child will depend on a well-timed and ſkilful application of the ſurgeon's hands.

The unfavourable poſition of the head may be referred to two kinds, which include a conſiderable variety. 1. When the fontanella, or open of the head, preſents inſtead of the vertex. 2. Face-caſes.

If no other obſtacle appears but the preſenting of the fontanella, the labour will by proper management generally end well; and much injury may be done by the intruſion of officious hands.

Face-caſes are the moſt difficult and laborious of all kinds of births; and our ſucceſs in theſe will chiefly depend upon a prudent management, by carefully ſupporting the ſtrength of the woman. The varieties of face-caſes are known by the direction of the chin; for the face may preſent, 1. With the chin to the pubes; 2. To the ſacrum; 3. To either ſide. The rule in all theſe caſes is to allow the labour to go on till the face be protruded as far down as poſſible. It is often as difficult and hazardous to puſh back the child, and to bring down the crown or vertex, as to turn the child and deliver it by the feet. Sometimes a ſkilful artiſt may ſucceed in his attempt to alter the poſition, when he has the management of the delivery from the beginning; or, in thoſe caſes where the face is conſiderably advanced in the pelvis, may be able to give aſſiſtance by paſſing a finger or two into the child's mouth, and pulling down the jaw; which leſſens the bulk of the head; or, by preſſing on the chin, to bring it under the arch of the pubes; when the crown getting into the hollow of the os ſacrum, the head will afterwards paſs eaſily.

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3dly, The breadth of the ſhoulders, or their tranſverſe deſcent through the pelvis, rarely proves the cauſe of protracted labour. The head is always pretty far advanced before any obſtruction can ariſe from this cauſe; and if the head has already paſſed, in a pain or two the ſhoulders will follow. The ſame reaſoning will alſo apply with regard to the aperture of the uterus itſelf, if the head paſſes freely, in like manner will the ſhoulders; the os uteri rarely, if ever, is capable of contracting upon the neck of the child, and thus preventing the advance of the ſhoulders; and ſhould this prove the caſe, what can we do but wait with patience? After the delivery of the head, if the woman falls into deliquia, or if, after ſeveral pains, the ſhoulders do not follow, and the child's life be in danger from delay, we ſhould naturally be induced to help it forward in the gentleſt manner we are able, by paſſing a finger on each ſide as far as the axilla, and thus gradually pulling along.

III. Laſtly, From the ſecundines, difficulty and danger ſometimes ariſe.

1ſt, The rigidity of the membranes, and the contrary. From the firſt of theſe cauſes, the birth is ſometimes rendered tedious; but as the ſame effect is much oftener produced by the oppoſite cauſe, and the conſequences of the latter are more troubleſome and dangerous than the former, we ſhould always be exceedingly cautious of having recourſe to the common expedient of breaking the membranes, which ought never to be done till we be certain the difficulty depends upon this cauſe; and, even then, the head of the child ſhould be well advanced, and the membranes protruded almoſt as far as the os externum. Many inconveniences ariſe from a premature evacuation of the waters; for thus the parts become dry and rigid, a conſtriction of the os uteri for a time enſues, the pains often either remit or become leſs ſtrong and forcing, though not leſs painful and fatiguing; the dilatation goes on ſo ſlow, and the labour becomes ſo ſevere, that the woman's ſtrength and ſpirits, by the unprofitable labour, are quite overcome and exhauſted; ſo that the head remains confined in the paſſage, merely from want of force of pain to puſh it forwards. The woman in the beginning of labour ſhould therefore be treated with the utmoſt delicacy and gentleneſs. The work of nature is too often ſpoiled by officious hands. She ſhould be ſeldom touched while the membranes are whole, leſt they ſhould be ruptured; and, even when touching is neceſſary, this ſhould only be done when

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the pains begin to remit, and the tenſe membranous bag to relax.

2dly, Too great a quantity of water may prevent the uterus from contracting, and thus weaken the force of the pains. Though this may, however, occaſion a delay, it will never be attended with more dangerous conſequences; and the ſame advice already given will hold equally good in this caſe, that the membranes ſhould never be broken till the ſoft parts be completely dilated; and we are aſſured that the difficulty or delay proceeds only from this cauſe.

3dly, The funis umbilicalis too long. The funis may be faulty from its too great length, or the contrary: thus the extraordinary length, by forming circumvolutions round the child's neck or body, ſometimes proves the cauſe of protracting the labour. But as this can only happen when the chord is of an uncommon length, there is generally enough left to admit of the exit of the child with ſafety; and it is time enough, in general, after the child is born, to ſlip the nooſe over the ſhoulders or head: there is ſeldom occaſion to divide the chord in the birth; a practice that may be attended with trouble and hazard.

The practice of introducing a finger in ano, to preſs back the coccyx, or to prevent the head, when it advances, from being re-tracted by circumvolutions of the chord, is now entirely laid aſide; an expedient that can anſwer no end, but that of fretting and bruiſing the parts of the mother, and injuring thoſe of the child.

Funis too ſhort. The funis is ſometimes thick and knotty, or preternaturally thickened by diſeaſe. In this caſe, part of the placenta may be ſeparated as the child advances through the pelvis, and thus a flooding will enſue; or the funis may be actually ruptured, and occaſion the death of the child, if the birth does not quickly follow. Such caſes, however, rarely happen.

An inconvenience, at leaſt fully as bad as the former, may ariſe from the too great length of the funis, though it may depend on other circumſtances: *viz.*

4thly, The prolapſus of the funis before the head. In this caſe, the funis, if poſſible, ſhould be puſhed up above the preſenting part; for, if the labour pains are ſlow, and the chord becomes cold, or the pulſation in it begins to grow languid, the circulation will thus be interrupted, and the life of the child deſtroyed. If the head is far advanced in the pelvis, and the child's life in danger, the delivery may be performed with the forceps. But to puſh up the head, and turn the child with a view to preſerve its life, as many authors recommend, is a practice by no means adviſeable: we ſhould ſeldom, in this poſition, be enabled to ſave the child; and turning under ſuch circumſtances can never be done but at the immediate hazard of loſing the mother.

5thly, Placenta attached towards the cervix or os uteri. This caſe is truly melancholy; for, if the delivery is not ſpeedily accompliſhed, the effuſion from the uterine veſſels will be ſo copious and profuſe, that the unfortunate woman muſt in a very ſhort time periſh. On this occaſion the delivery muſt be conducted in the beſt manner the judgment and ſkill of the operator can direct, and with as much expedition as the ſafety of the mother will admit.

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Thus, in moſt laborious caſes, provided the woman's ſtrength be ſupported, the management properly regulated, the natural moiſture of the parts when deficient ſupplied, manual aſſiſtance very ſeldom becomes requiſite; but as caſes do occur, wherein nature, with all advantages, will fail, and the common methods of relief prove unſucceſsful, recourſe muſt be had to more powerful means, while the woman is able to ſupport the conflict. In all ſuch caſes, the condition of the patient, the ſtructure and ſtate of the parts, and poſition of the preſenting part of the child, muſt very carefully be conſidered.

Method of Delivery by Inſtruments.

When the powers of nature are inſufficient to expel the child, extraordinary aſſiſtance muſt be had recourſe to. In laborious births, this is chiefly of two kinds.

I. The head is either extracted as it preſents: or,

II. Its diameter is diminiſhed previous to the extraction.

The head may be detained from advancing through the pelvis by all the cauſes formerly enumerated.—Theſe are chiefly included in four general ones.

1. Weakneſs in the mother.
2. Narrowneſs of the pelvis.
3. The bulk of the head of the child; or,
4. Its diſadvantageous poſition.

Whatever is the cauſe, when the natural pains begin to remit, and the parts of the woman begin to ſwell; when her ſtrength declines, her pulſe grows feeble, and there is no proſpect of advantage to be gained by delay; meaſures muſt be taken for aſſiſting the delivery, otherwiſe both mother and child may periſh from neglect.

As inſtruments are never to be employed but in the moſt urgent and neceſſitous caſes, and expreſsly with a view to preſerve the life of mother or child, or both; thoſe of a ſafe and harmleſs kind ſhould always be made trial of, in preference to thoſe of a deſtructive nature.

Uſe of the Forceps.

The forceps is an inſtrument intended to lay hold of the head of the child in laborious births, and to extract it as it preſents. This inſtrument, as now improved, in the hands of a prudent and cautious operator, may be employed without doing the leaſt injury either to mother or child.

In every obſtetrical caſe, wherein manual aſſiſtance becomes neceſſary, the contents of rectum and bladder ſhould, if poſſible, be previouſly emptied.

The membranes alſo ſhould be broken, the ſoft parts completely dilated, and the head of the child as far as poſſible advanced, previous to the uſe of any inſtrument.

The form and ſtructure of the parts of the woman, the ſituation and progreſs of the preſenting part of the child, muſt at this time be carefully conſidered. The concavity of the ſacrum, for inſtance, will determine the progreſs of the labour. The touch of the vertex, fontanella, lambdoidal, or ſagittal ſuture, the fore or back

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back part of the ear, or ſome part of the face, will aſcertain the true preſentation of the child.

The lower the head is advanced in the pelvis, our ſucceſs with the forceps is the more to be depended on. For when it has proceeded as far as the inferior aperture, by means of this inſtrument it may be readily relieved; but when the head of the child is confined at the brim, both the application of inſtruments, and the extraction by this means, are exceedingly difficult and dangerous.

The head may be ſo firmly wedged in the pelvis that the forceps can neither be introduced nor fixed without bruiſing or tearing the parts of the woman: whatever, therefore, inſurmountable difficulties occur, either in applying or extracting with the forceps, the life of the mother muſt not be endangered by fruitleſs efforts: the head of the child muſt immediately be opened, and the delivery accompliſhed without further delay.

In laborious births, the proper forcep-caſes may be reduced to two, which include, however, a conſiderable variety. Theſe are,

I. The ſmooth part of the cranium.

II. The face, preſenting.

The head may preſent,

1ſt, Naturally, when low advanced in the pelvis, with the vertex to the pubes, and the forehead or face in the hollow of the ſacrum. Or,

2dly, When higher in the pelvis, the vertex may preſent with the face laterally, the ears to the pubes and ſacrum. Or,

3dly, The fontanel may preſent with the face to the pubes and vertex to the ſacrum; or with the vertex to the pubes and face to the ſacrum.

1. When the head preſents naturally. The woman in this caſe muſt be placed on her back a-croſs the bed, properly ſupported; the accoucheur, ſeated before or in a kneeling poſture, after gradually lubricating the perinæum and vagina, muſt proceed gently to ſtretch the parts, by paſſing the hand in a conical manner through the os externum vaginæ, puſhing it forwards by the ſide of the child's head, till it advances as far as an ear, if poſſible: along this hand he is to guide a blade of the forceps, which with the other hand he introduces in the direction of the line of the pelvis, holding the handle backwards towards the perinæum, and keeping the clam cloſely applied to the child's head. This muſt be inſinuated very gradually by a kind of wriggling motion, puſhing it on till the blade is applied along the ſide of the head over the ear; he muſt then gently withdraw the firſt hand from the pelvis, with which he muſt ſecure the handle of the blade of the forceps already introduced, till the other blade be paſſed along the other hand, in the ſame ſlow cautious manner: the handles muſt then be brought oppoſite to each other, carefully locked, and leſt they ſlip in extracting, properly ſecured by tying a fillet or garter round them; but this muſt be looſed during the remiſſion of pulling, to prevent the brain from being injured by the preſſure. The extraction muſt be made by very ſlow and gentle degrees, and with one hand only, while the other is employed to guard the perinæum: the motion in pulling ſhould be from blade to blade; the accoucheur muſt reſt from time to time, and, if the pains are not gone, ſhould always in his efforts only co-operate with thoſe of nature. The child and mother will ſuffer leſs by going on in this gradual manner than by precipitating the birth, which can never be done but at the riſk of deſtroying both. If, in making the extraction, the forceps ſlip, they muſt be cautiouſly withdrawn blade by blade, and again introduced in the ſame manner.—When the tumour of the perinæum forms, and the vertex begins to protrude at the os externum, the accoucheur muſt ariſe from his ſeat, raiſe the handle gently upwards, and by a half round turn, bring the hind-head from under the ſymphyſis or arch of the pubes; remembering carefully to guard the perinæum from laceration and its conſequences, to which it is now ſo greatly expoſed.

Difficult Labour.

In attempting the introduction of either blade, if it meets with any interruption, it muſt be as often withdrawn, and puſhed up again in a proper direction till every difficulty be ſurmounted; and if, from the ſmallneſs or conſtriction of the parts, the introduction of the ſecond blade ſhall ſeem impracticable, the former one muſt be withdrawn, and the latter muſt be firſt introduced.

2. The vertex may preſent with the face laterally in the pelvis. It is always difficult to apply the forceps till the bulky part of the head has paſſed the brim; and here it is not only difficult to the operator, but extremely hazardous to the patient, to introduce this inſtrument till the ear of the child has got under the pubes. When the ears thus preſent to pubes and ſacrum, the woman ſhould be placed on her ſide or knees, the moſt difficult blade of the forceps ſhould be firſt applied, which is the one under the pubes; when both are paſſed, and properly ſecured, the patient ſhould again be turned to her back, before the operator attempts to extract, and the head in this caſe (as the quarter-turn can ſeldom be made with ſafety) ſhould be delivered in the manner wherein it preſents; becauſe, when confined any time in the paſſage, its figure is altered by the overlapping of the bones, in ſuch a manner that it paſſes along, in general, with far leſs difficulty than to attempt to puſh up and make the mechanical turns; a work often altogether impracticable, by which contuſion or laceration of the parts of the woman, and the moſt fatal conſequences, may be occaſioned. The handles of the forceps muſt here particularly be well preſſed backwards towards the perinæum, that the clams may humour the curvature and intruſion of the ſacrum, and accommodate themſelves to the form of the child's head.

This is a caſe wherein the forceps often fail; if ſo they will ſometimes ſucceed by varying the mode of application, and fixing them over the forehead and occiput; if this method fails alſo, the ſize of the head muſt be diminiſhed, and the extraction made with the blunt hook or crotchet.

3. The fontanella may preſent with the face to the pubes. This is the moſt common of the fontanel caſes; though ſometimes the face is lateral in the pelvis, ſometimes diagonal, and ſometimes it is turned to the ſacrum. The true poſition is aſcertained by the direction of the fontanel, and that of the ear. Here, as in other laborious births, nature ſhould be intruſted as long as we dare. The hand does not always de-

ſcend mechanically through the capacity of the pelvis, as ſome practitioners have ſuppoſed; nor will the deviation from its ordinary mode of deſcent always of itſelf influence the delivery, at leaſt very rarely in ſuch a manner as to require extraordinary aſſiſtance. In whatever manner the head preſents, when it is ſituated high in the pelvis, the delivery cannot be effected without difficulty or hazard; in ſuch circumſtances, the application of the forceps will frequeutly baffle the utmoſt efforts of the accoucheur, and the conſequences of ſuch attempts may prove fatal to mother and child.

When extreme weakneſs in the mother, floodings, convulſions, or other urgent ſymptoms, render it neceſſary to force the delivery, whether the face be to pubes or ſacrum, the forceps may be applied along the ears, in the ſame manner as directed in a natural labour; and the head, for the reaſons already given, ſhould be brought along in the manner it preſents: the extraction ſhould be made with great deliberation, that the parts of the woman may have time to ſtretch; the perinæum muſt be carefully ſupported; the forceps muſt be gently releaſed, when the head is delivered; and the reſt of the delivery conducted as in a natural labour.

In this caſe, when ſituated high in the pelvis, the fontanel preſenting, and the face either to pubes or ſacrum, the long axis of the head interſects the ſhort diameter of the pelvis, and very often, though the forceps be applied, and a firm hold of the head be obtained, it is not poſſible to bring it along with all the force we dare exert. If this method therefore fails, the common forceps ſhould be cautiouſly withdrawn, and the long ones applied if poſſible, over the forehead and occiput, when the ſize of the head, by the compreſſion it ſuffers in paſſing along, being perhaps ſomewhat diminiſhed, the extraction will be ſucceſsfully performed. This method alſo failing, previous to the operation of embryotomy, Dr Leak's forceps, with the third blade, may be had recourſe to. But of this little can be ſaid with confidence, till the inſtrument has been more generally employed. From the difficulty of ſucceeding in the application of the common forceps, it may, *à priori*, be concluded, that the introduction of a third blade, even in the hands of an expert practitioner, however ingenious the invention, is an expedient not eaſily to be put in practice. Neither is Roonhuyſe's lever, or a blade of the forceps paſſed up between the pubes and fore-head or hind-head of the child, in order to procure the delivery of the head, to be recommended in ſuch caſes: however ſome have boaſted of its ſucceſs, it is an inſtrument that may do much miſchief; and few practitioners can uſe it with ſafety.

II. *Face preſenting.*—Of laborious births, face-caſes as we have already obſerved, are the moſt difficult and the moſt dangerous. From its length, roughneſs, and inequality, the face muſt occaſion greater pain; and from the ſolidity of the bones, it muſt yield to the propelling force with much more difficulty, than the ſmooth moveable body of the cranium. Face-caſes are the moſt troubleſome that occur in the practice of midwifery, and in which the moſt expert practitioners may be foiled in their attempts; and theſe attempts, if too early exerted, will be followed in many inſtances with fatal conſequences. Whatever way the face preſents, it ſhould be allowed to advance as low as poſſible in the pelvis; by which means the acceſs will be more eaſy, and the poſition, for the application of inſtruments, more favourable. In this aukward ſituation, much miſchief may be done by raſhneſs; whereas, if time be allowed, and the patient be properly ſupported, the delivery will generally end well.

The face may preſent with,
1. The chin to the pubes.
2. to the ſacrum.
3. laterally.

From the difficulty of applying inſtruments in theſe caſes, ſome authors recommend, as an univerſal practice, to turn the child, and deliver by the feet. But this in general is a dangerous practice, and ſeldom or never adviſeable, except when the membranes remain entire, till the os uteri is completely dilated, and the head continues looſe about the brim of the pelvis; and even then the propriety of the practice is doubtful; becauſe if the head is ſmall, or the pelvis be well proportioned, the face will deſcend without much difficulty; and if otherwiſe, beſides the riſk in attempting to turn, the child may be loſt from the preſſure of the chord, or the difficulty of extracting the head after the delivery of the body.

When aſſiſtance becomes neceſſary, the beſt practice in face-caſes is the following: Having placed the patient in a convenient poſture, let the accoucheur in the gentleſt manner paſs his hand within the pelvis; and during the remiſſion of pain only, endeavour to raiſe the head of the child, ſo that he may puſh up the ſhoulders entirely above the brim of the pelvis, and thus change the poſition of the face: by this means, if ſucceſsful, he will be able to reduce the firſt of theſe caſes, ſo as to make the fontanel preſent with the face to the pubes; he will reduce the ſecond ſo as to bring down the vertex, with the face to the ſacrum; and the third he will reduce to a vertex caſe, with the face lateral. The delivery may be afterwards truſted to nature; which failing, there is eaſier acceſs for the application of inſtruments to make the extraction, as already directed. The ſucceſs, however, of the accoucheur, in altering the poſition of the head, by puſhing it up, will entirely depend on the time he is called; for, ſhould the head be firmly wedged in the pelvis, no force he dares employ will be ſufficient to alter the poſture

If therefore every attempt to reduce the face, and make the vertex or fontanel preſent, ſhall prove unſucceſsful, and ſymptoms are urgent, the forceps muſt be applied over the ears of the child, and the extraction performed in the beſt manner the operator is able. And, failing theſe, immediate recourſe muſt be had to the crotchet.

1. In the firſt caſe, previous to the introduction of the forceps, the chin if poſſible ſhould be advanced below the pubes.

2. In the ſecond, the chin ſhould be advanced to the inferior part of the ſacrum. And,

3. In the third, the chin ſhould be as low as the hinder part of the tuber iſchii: and although in general the head is to be extracted as it preſents, if the operator meets with conſiderable reſiſtance, it muſt be gently puſhed up and turned with the chin, either laterally,

terally, below the pubes, or into the hollow of the ſacrum, according to the particular circumſtances of the caſe, and in a direction beſt accommodated to the form and diameter of the pelvis.

Uſe of the Sciſſars, Crotchet, and Blunt Hook.

When the head of the child, from its ſize, unfavourable poſition, or from a fault in the pelvis, cannot be protruded by the force of natural pains, nor extracted by the forceps, recourſe muſt be had to more violent means, and the life of the child muſt be deſtroyed in order to preſerve that of the mother. This operation was by the ancients called *embryotomy*.

When the head, from its extraordinary bulk, is detained at the brim of the pelvis; on evacuating the contents, the bones of the cranium immediately collapſe, and the head is afterwards propelled by the force of the labour-pains; failing which only, the extraction muſt be made with the blunt-hook or crotchet.

The unfavourable poſition of the head is of itſelf a cauſe inſufficient to juſtify the uſe of deſtructive inſtruments, which ought never to be employed but in extreme caſes, after every milder method has failed. From the difficult acceſs to the cranium in order to make a perforation and evacuate the brain, a face-caſe makes a very troubleſome and dangerous crotchet one. Very luckily, in narrow pelviſes, the face rarely preſents, and very ſeldom advances far in that direction; at other times, the poſition may be ſo altered, that the crown, the back of the ear, or ſome other part of the cranium, can be reached; otherwiſe the crotchet muſt be fixed in the mouth, orbit of the eye, &c. and the head brought along in that direction, till the ſciſſars can be employed to open the ſkull.

But the grand cauſe of difficult labour is, the narrowneſs or diſtortion of the pelvis. For when, at the brim, inſtead of four inches and a quarter from pubes to ſacrum, it meaſures no more than one and a half, one and three-fourths, two, or two inches and one-fourth, the uſe of inſtruments becomes abſolutely requiſite, and very frequently in thoſe of two inches and one-half, and three inches; or when the diameters through the capacity, or at the inferior aperture, are retrenched in the ſame proportion, difficulties will in like manner ariſe, and the delivery, except the labour be premature, or the child of a ſmall ſize, cannot be accompliſhed without the aſſiſtance of deſtructive inſtruments.

We judge of the form of the woman; by the progreſs of the labour; by the touch. When the fault is at the inferior aperture, the touch is pretty deciſive; *e. g.* if a bump is felt in the os ſacrum inſtead of a concavity; if the coccyx is angulated; if the ſymphyſis pubis projects inwards in form of an acute angle; if the tuberoſities of the iſchia approach too near each other; or the one tuber be higher than the other; ſuch appearances are infallible marks of a diſtorted pelvis. But when the narrowneſs is confined to the brim, this is only to be diſcovered by the introduction of the hand within the pelvis: the projection of the lumbar vertebræ over the ſacrum, is a ſpecies of narrow pelvis that moſt frequently occurs in practice. In this caſe, the child's head, by the preſſure it ſuſtains between the pubes and ſacrum, is moulded into a conical or ſugar-loaf form, the parietal bones are ſqueezed together, over-lapping one another, and will be felt to the touch when the labour is advanced, like an acute ridge, ſomething in the form of a ſow's back.

Inſtead of the complicated inſtrumental apparatus invented by the ancients, ſuch as ſcrews, hooks, &c. for fixing in, laying hold of, and extracting the head as it preſented, an operation in many caſes difficult and dangerous, when the head was bulky or the pelvis narrow, as the woman frequently loſt her life in the attempt; the practice of diminiſhing the ſize of the head, by opening the cranium and evacuating the brain, previous to the extraction, is a modern improvement, and an important one: the inſtruments for this purpoſe conſiſt ſimply of a pair of long ſciſſars, a ſharp curved crotchet, and a blunt hook: theſe are preferable to every other, whether of an ancient or modern conſtruction.

When the accoucheur is under the diſagreeable neceſſity of deſtroying the child to preſerve the mother, ſhe muſt be laid in the ſame poſition as already adviſed for the application of the forceps; and the ſame rules, recommended for the one operation, will in general apply to the other.

Thus, in the narroweſt pelvis that occurs, previous to opening the cranium, the ſoft parts ſhould be completely dilated, and the head of the child ſhould be fixed ſteadily in the pelvis and advanced as far as poſſible; for while the head is high and looſe above the brim, the application of inſtruments is very difficult as well as hazardous.

The long ſciſſars muſt be cautiouſly introduced into the vagina, directed by the hand of the accoucheur; the points muſt be carefully guarded, till they preſs againſt the cranium of the child, which they muſt be made to perforate with a boring kind of motion, till they are puſhed on as far as the reſts; they muſt then be opened fully, carefully re-ſhut, half turned, and again widely opened, ſo as to make a crucial hole in the ſkull. They muſt afterwards be puſhed beyond the reſts, opened diagonally again and again, in ſuch a manner as to tear and break to pieces the bones of the cranium; they muſt then be ſhut with great care; and withdrawn along the hand, in the ſame cautious manner as they were introduced, leſt they ſhould bruiſe or tear the uterus, vagina, or any other part of the woman. After a free opening in the cranium has thus been made, the brain muſt be ſcooped out with the fingers or blunt-hook, and the looſe ſharp pieces of bone muſt be carefully ſeparated and removed, that no part of the woman be tore while the head is extracting. The teguments of the ſcalp ſhould now be brought over the ragged bones of the cranium, and the woman ſhould be allowed to reſt an hour or two, according to her ſtrength and other circumſtances: the bones of the cranium will now collapſe; and if the woman has as much ſtrength remaining, or the pelvis be not much diſtorted, the head being thus diminiſhed, will be protruded by the force of natural pains; otherwiſe it muſt be extracted, either by means of two fingers introduced within the cavity of the cranium, by the blunt-hook introduced in the ſame manner, guarding the point on the oppoſite ſide while making the extraction; or, failing theſe, by the crotchet, which, though dangerous in the hands of an ignorant raſh operator, may be employed by the prudent practitioner with as much ſafety as the blunteſt inſtrument.

The method of introduction is the ſame with a blade of the forceps. The chief thing to be attended to is, to guard the point till it be applied againſt the head, and firmly fixed in its hold, which ſhould always be ſomewhere on the outſide of the cranium: provided a firm hold is obtained, no matter where, behind the ears, about the os petroſum, orbits of the eyes, maxilla inferior, &c. according to the preſentation of the head. The woman being properly ſecured, and the handle of the inſtrument covered with a cloth, the operator muſt then pull, at firſt gently, afterwards more forcibly, reſting from time to time, and endeavouring to make the extraction in the beſt manner the circumſtances of the caſe will admit of. If the pelvis be much diſtorted, ſo that, by means of the utmoſt ſtrength the accoucheur can exert, little purchaſe is made, he may apply to the oppoſite ſide a blade of the forceps, which are now ſo conſtructed as to lock with the crotchet; let him then bring the handles together, ſecure properly, and thus endeavour to make the extraction. Should this expedient alſo fail, the blade of the forceps muſt be withdrawn, the other blade of the crotchet muſt be applied, the handles brought together and ſecured, and the extraction made, moving from blade to blade.

Should the head preſent in ſuch a manner, that, in attempting to extract it, the crotchet divides the vertebræ of the neck, and the head is thus ſevered from the body, an accident that can only happen in the hands of an ignorant blundering practitioner; the head muſt be puſhed up above the brim of the pelvis, the crotchet or blunt hook muſt be fixed under the axilla, the arms muſt be brought down, and the body extracted, by fixing the crotchet below the ſcapula on the ſternum, or among the ribs; the head muſt afterwards be extracted in the manner already adviſed: or ſhould the head in extracting be pulled from the body, as may happen when the child has been long dead, or when it is putrid, the delivery of the body muſt be effected by means of the crotchet as now directed; a method preferable to that of turning, as ſome adviſe.

If the head, inſtead of yielding to the force of pulling, be at laſt cut and broken in pieces, the operator muſt endeavour to bring down an arm of the child, to fix the crotchet about the jaw or neck, pull at both holds, and thus attempt to make the extraction; this alſo failing, he muſt bring down the other arm, fix the crotchet in the thorax, and, in a word, muſt tear the child in pieces, that the delivery may be accompliſhed by any means.

In face-caſes, where it is impracticable to alter the poſition, and when the pelvis is much diſtorted, the double crotchet is ſometimes requiſite; the handles muſt be well ſecured, kept well backwards towards the perinæum, and the motion always from blade to blade. It very ſeldom, however, happens, that there is occaſion for the double crotchet: by this means the head is flattened in pulling; whereas if one blade only can be employed, the head is lengthened, and, in pulling, can better accommodate itſelf to the ſhape of the pelvis as it paſſes along.

Chap. III. *Preternatural Labour.*

In whatever manner the child preſents when the body is delivered before the head, the birth is accounted preternatural.

Preternatural labours may be referred to one of the four following claſſes.

I. When one or both feet, knees, or the breech, preſent.

II. When the child lies acroſs in a rounded or oval form, with the arm, ſhoulder, ſide, back, or belly, preſenting.

III. When one or both of the upper extremities preſent, the child lying in the form of a ſheath, the feet towards the fundus uteri, the waters evacuated, and the uterus ſtrongly contracted round the body of the child.

IV. Laſtly, Premature or flooding caſes, or others in which it may be neceſſary to force the delivery, either previous to the rupture of the membranes, or quickly after it.

The cauſes of croſs labours moſt commonly aſſigned by authors are, The obliquity of the uterus: circumvolutions of the funis umbilicalis round the child's body; the ſhortneſs of the funis, or attachment of the placenta towards the fundus uteri; ſhocks affecting the mother when pregnant, &c. The poſition of the fœtus may alſo be influenced by its own motion and ſtirrings, by the particular form and bulk of its body, by the manner of ſtretching of the uterus, by the quantity of liquor amnii, and by many other circumſtances.

The ſymptoms that indicate an unfavourable poſition of the child, before it can be diſcovered by the touch, are very uncertain and fallacious; a croſs birth may however, be ſuſpected,

1ſt, If the pains be more ſlack and trifling than ordinary.

2dly, If the membranes be protruded in a long form like a gut, or the finger of a glove.

3dly, If no part of the child can be diſcovered when the uterine orifice is conſiderably opened.

4thly, If the preſenting part through the membranes be ſmaller, feels lighter, and gives leſs reſiſtance than the bulky ponderous head.

5thly, Laſtly, after the rupture of the membranes, if the meconium of the child be paſſed along with the waters, it is a ſign that the breech preſents, or that the child is dead.

Preternatural labours are difficult or hazardous, according to,

1. The form of the pelvis, and general health and conſtitution of the woman.

2. The bulk of the child, and its manner of preſenting.

3. The time the waters have been evacuated, and the uterus contracted round the body of the child.

4. When complicated with plurality of children; the prolapſis of the funis umbilicalis; the limbs of the child entangled with the chord; profuſe and violent flood-

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floodings from the attachment of the placenta towards the cervix uteri, &c.

Turning is often laborious, and always dangerous in proportion to the force uſed in ſearching for and bringing down the feet; though in general, the difficulty and hazard are not ſo great, as in many caſes ſtrictly called *laborious*, when the head preſents; the treatment of preternatural labours being better known, and for the moſt part eaſier put in practice.

Each claſs of the general diviſion of croſs labours includes a variety of different caſes. By conſidering a few of every claſs, a general idea of the whole will be formed.

CLASS I.

Case 1. The ſimpleſt and eaſieſt caſe is the Agrippan poſture, when the child preſents with the feet.

The foot is to be diſtinguiſhed from the hand, firſt, by the weight and reſiſtance it gives to the touch; ſecondly by the ſhortneſs of the toes; thirdly, by the projecting heel.

When the feet preſent in the paſſage, the labour ſhould be allowed to go on as if natural. If the child be of an ordinary ſize, the woman in health, the parts well proportioned, in the way of aſſiſtance nothing further ſeems neceſſary but the application of a warm cloth round the body of the child, which muſt be properly ſupported till it advances as far as the pains are able to force it. If the ſize be ordinary, or rather ſmall, it will ſometimes make the mechanical turns and be entirely puſhed along by the force of the natural pains; but it generally ſtops at the ſhoulders, after the breech protrudes without the os externum, where the reſiſtance is ſo great, that the accoucheur's aſſiſtance becomes requiſite.

In this caſe, the patient muſt be placed on her back, properly ſupported; the hand of the accoucheur muſt be cautiouſly introduced; the parts of the woman muſt be gently ſtretched; the feet of the child muſt be laid hold of, and brought as low in the vagina as poſſible; a ſoft warm cloth muſt be wrapped around them, and the extraction muſt be performed in a ſlow cautious manner, making large motions in a circular or lateral direction, reſting from time to time, if the pains are gone; and if not, always waiting for the natural efforts. When advanced as far as the breech, the body, if not already in a proper direction, muſt be puſhed up, and gently turned with the face towards the mother's back; and to make ſure that the face turns with the body, or to prevent the chin, vortex, or ſhoulders, from catching on the pubes, or angle of the ſacrum, an extraordinary quarter-turn more muſt be made: this muſt be reverſed previous to the extraction; and the difficulty ariſing from the obſtruction of the ſhoulders muſt be removed in the following manner: While the breaſt and legs of the child are ſupported over the palm and fore-arm of the one hand of the accoucheur, which he draws towards one ſide, he muſt introduce two fingers of the other hand at the oppoſite ſide into the vagina, over the back-part of the ſhoulder, as far as the elbow, and endeavour in the moſt gentle manner to bring down the arm, always remembering in his movements to humour the natural motions of the joint: he muſt then ſhift hands, when the other arm is to be relieved in the ſame manner: both arms being brought down, the woman muſt now reſt a little, when a pain or two generally follows, and the head is alſo forced along. But ſhould the woman be much exhauſted, and if the head does not quickly advance, the child may be loſt from delay. The extraction of the head in preternatural labours is often the moſt difficult and the moſt dangerous part of the delivery; the cauſe of reſiſtance, when it does not advance, is chiefly owing to its confinement between the angle of the ſacrum and pubes, when the bulky part of the head is detained at the brim; whether the reſiſtance be here or towards the inferior aperture of the pelvis, if the head does not advance in a pain or two, the extraction muſt be made in this manner: While the right hand of the accoucheur ſupports the body of the child below, with two fingers preſſing on either ſhoulder, the left hand and fingers muſt in the ſame manner be placed over the back of the neck, and pulling gently in the direction from pubes to ſacrum, he muſt thus endeavour to bring it along; but, ſhould the pelvis be narrow, or the child's head of a large ſize, or the face be laterally or anteriorly placed in the pelvis, or, what rarely happens, the os uteri contracted round the neck of the child; in either of theſe caſes, the accoucheur will ſometimes meet with the utmoſt difficulty. When the above method therefore fails, he muſt introduce two fingers of the right hand into the child's mouth, while thoſe of the left-hand are expanded over the ſhoulders, as already directed; and in this way he muſt endeavour to relieve it, pulling from pubes to ſacrum, alternately raiſing and depreſſing the head till it advances low down, ſo that the face deſcends from the hollow of the ſacrum, when the accoucheur muſt riſe from his ſeat, and bring the hind-head from the pubes with a half round turn, imitating that of a natural labour.

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If the poſition be unfavourable, the face, if poſſible ſhould be turned to the ſacrum, by puſhing up the head, or by puſhing back the chin; If the contraction of the uterus is the cauſe of reſiſtance, which rarely occurs, it muſt be gently ſtretched with the fingers. Or if the difficulty ariſes from circumvolution of the chord round the legs, thighs, body, or neck of the child, theſe muſt be diſengaged in the eaſieſt manner poſſible; it is rarely neceſſary to divide the funis on this account.

Should every method fail in bringing down the head, the delivery muſt be effected by means of the forceps cautiouſly paſſed over the ears, with the handles under the child's body, in a direction downwards towards the perinæum. If the pelvis be very narrow, or the head of a large ſize, it muſt be opened by puſhing the ſciſſars through the occipital bone, ſo that the contents of the cranium may be evacuated, and the extraction made by means of the forceps, blunt hook or crotchet. But if the head, by the efforts to extract it, be actually ſevered from the body, and left behind in the uterus, an accident which ſometimes occurs, it muſt be delivered by incloſing it in the forceps, while ſecured from rolling by preſſing externally on the abdomen. If the forceps cannot be applied, the cranium muſt be opened, the texture of the brain deſtroyed, and the extraction performed by the fingers of the accoucheur, by the blunt-hook, or by the crotchet. If the under-jaw remains, the head may be effectually ſecured till locked in the forceps, or till its bulk be diminiſhed, by introducing a finger into the mouth, thruſting it through the jaw under the chin, drawing it down, and paſſing a ligature through the perforation.

In caſes where the child has been long dead, ſhould the belly or thorax be diſtended with air or water, and prove the cauſe of obſtruction, the contents muſt be evacuated by opening with the ſciſſars or tearing with the crotchet; and in general, where difficulties occur, the delivery muſt be accompliſhed in that manner the circumſtances of the caſe will beſt admit of.

Caſe 2. When inſtead of two, one foot only falls into the vagina, the other is ſometimes detained by catching on the pubes, and if eaſily come at, ſhould be brought down, always remembering to humour the natural motion of the joint; but, ſhould the leg be folded up along the child's body, the attempt is ſometimes both difficult and dangerous, and ought not to be perſiſted in, as the breech will either be forced down by the aſſiſtance of natural pains, or by gently pulling by one leg only.

Caſe 3. When one or both knees preſent, the delivery muſt be conducted in the ſame manner with that of the feet.

Caſe 4. When the feet offer along with the breech, this laſt muſt be puſhed up, while the former are ſecured and brought down till it be reduced to a footling caſe, and otherwiſe managed as above.

Caſe 5. The breech may preſent with the fore-parts to the mother,

1ſt, Anteriorly;

2dly, Laterally; or,

3dly, Poſteriorly.

Sometimes the breech may be diſcovered, previous to the rupture of the membranes; but afterwards with more certainty, by the meconium of the child paſſed with the waters, and by the touch.

In whatever manner the breech preſents, the delivery ſhould be ſubmitted to nature, till the child be advanced as far as the thorax, when the feet are to be brought down and laid hold of, the child, if neceſſary puſhed up, the mechanical turns effected; and the delivery otherwiſe conducted as in a footling caſe. There is much leſs hazard in general, agreeable to an old obſervation of Mauriceau, in allowing the child to advance double, than in precipitating the extraction by puſhing up to bring down the feet before the parts have been ſufficiently dilated; a practice difficult and troubleſome to the operator; painful, and ſometimes dangerous, to the mother; and by which the child is expoſed to the riſk of ſtrangulation, from the retention of the head after the delivery of the body. If the child be ſmall, though doubled, it will eaſily paſs in that direction; if large though the labour be painful, the natural throes are leſs violent and leſs dangerous than the prepoſterous help of the accoucheur: If the child thus advances naturally, it will be leſs expoſed to ſuffer; if it does not advance, the parts of the mother will be prepared for the accoucheur to paſs his hand into the pelvis, to raiſe up the breech, to bring down one or both feet, and deliver as above.

Weakneſs in the mother, floodings and convulſions, a very large child, or narrow pelvis, the prolapſus of the funis, or its compreſſion between the thighs of the child, or between the child and pelvis, by which its life is endangered, if the chord cannot be reduced above the preſenting part, are the only exceptions to the general rule of treating the breech as a natural labour.

The practice of helping forward the breech, by paſſing the blunt-hook under the ham, is now entirely laid aſide; this can never be done with ſafety, till the breech be ſo low advanced, that the hand of the accoucheur can be uſed, which may be employed with more advantage as well as ſafety.

CLASS II.

In the former claſs of preternatural labours, it is adviſeable to truſt to nature in many caſes, as the birth will often be accompliſhed without manual aſſiſtance: but when the child lies a-croſs, no force of pain can make it advance in that poſition; and, without proper aſſiſtance, both the mother and child would periſh.

If the accoucheur has the management of the labour from the beginning, the child may be turned, in the worſt poſition, without difficulty; but when the waters have been for ſome time evacuated and the uterus ſtrongly contracted, turning is laborious to the operator, painful and dangerous to the mother. In ſuch caſes, the ancients endeavoured to make the head preſent; but from its bulk, they often failed, and the attempt was often attended with fatal conſequences. The method of delivering by the feet is the moſt important modern improvement in the practice of midwifery; an improvement to which many thouſands owe their lives.

When the child lies in a tranſverſe poſition, the accoucheur muſt inſinuate his hand through the vagina into the uterus in the gentleſt manner, ſearch for the feet, bring them down with the utmoſt caution, and finiſh the delivery as in footling-caſes. To effect this the following rules ſhould be obſerved.

1. The patient muſt be placed in a convenient poſture, that the operator may be able to employ either hand, as the various circumſtances of the caſe may require.

2. Though the beſt poſture, in general, is laying the woman on her back, it will be ſometimes neceſſary to turn her to her ſide; and, in theſe caſes, where the abdomen is pendulous, where it is difficult to reach the feet, or where they lie towards the fundus uteri, the woman ſhould be placed on her knees and elbows.

3. An exact knowledge of the true poſition of the child, and of the ſtructure and ſtate of the parts, ſhould be acquired, before attempting to make the delivery.

4. The orifice of the uterus ſhould be enlarged, ſo as freely to admit the hand; and the ſtronger pains ſhould be abated, before any attempt be made to deliver.

5. Should the waters be drained off, the parts dry and rigid, and the uterus contracted round the child, warm oil muſt be injected into the uterus, otherwiſe its rupture may be endangered.

6. In paſſing the hand into the uterus, this muſt be done

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done in the gentleſt manner; the parts muſt be well lubricated with butter or pomatum; the line of the pelvis muſt be attended to; the efforts of the operator muſt be ſlow and gradual; and thus the utmoſt rigidity in the ſoft parts will, in time, be overcome.

7. The hand muſt be introduced only during the remiſſion of pain; when pain comes, the accoucheur muſt always reſt; otherwiſe he may puſh his hand, or the fœtus, through the body of the uterus.

8. In puſhing up, to come at the feet, this muſt never be done with the points of the fingers, nor with the hand clenched, but with the palm of the hand or the broad expanded fingers, and always during the remiſſion of pain, and the latter ſhould alſo be obſerved in bringing down the legs; but, in making the extraction of the body, the efforts of the operator ſhould always co-operate with thoſe of nature.

9. The hand ſhould, if poſſible, be introduced along the anterior parts of the child; and both feet, if eaſily come at, ſhould be laid hold of.

10. In turning, the accoucheur ſhould never conſider the child as dead, nor allow himſelf to be deceived by ſymptoms doubtful and fallacious; the child is ſometimes born alive when he would leaſt of all expect it; therefore, in puſhing up, bringing down the legs, or extracting the body, it ſhould be handled with the greateſt delicacy.

11. When the hand is within the pelvis, it ſhould not always be moved in the line of the umbilicus but rather towards one ſide of the ſpine, by which more room is gained, and the prominent angle of the ſacrum avoided.

12. The hand ſhould be paſſed as far as the middle of the child's body, before attempting to ſearch for the feet or before attempting to break the membranes, ſhould theſe remain entire, till the aperture of the uterus will admit of the hand.

13. If the hand cannot paſs the preſenting part of the child to come at the feet, inſtead of violently puſhing back, the part ſhould be as it were lifted up in the pelvis, and moved towards a ſide; by which means difficulties may be ſurmounted, and great danger often prevented.

By attending carefully to the above rules, laceration of the uterus, floodings, convulſions, inflammations, and their conſequences, may be prevented; accidents that frequently happen in the hands of ignorant raſh operators.

Caſe 1.—*The arm preſenting.* The right is to be diſtinguiſhed from the left by laying hold of the child's hand, in the ſame manner as in ſhaking hands; and thus the general poſition of the child may be judged of.

When the accoucheur is called in early, the reduction is generally practicable; but if the arm protrudes through the vagina, and the ſhoulder be locked in the pelvis, it is needleſs, by fruitleſs efforts, for the accoucheur to fatigue himſelf, and diſtreſs his patient to attain a point by which he will gain no very material advantage; as the hand can be paſſed into the uterus by the ſide of the child's arm, which will, of courſe, return into the uterus when the feet are brought down into the vagina.

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In order to make the delivery, the hand of the accoucheur, well lubricated, muſt be conducted into the uterus by the ſide of the child's arm, along the thorax, at the oppoſite ſide of the pelvis where the head lies; if any difficulty occurs in coming at the feet, this hand muſt be withdrawn, and the other introduced in its ſtead; and if ſtill the hand cannot eaſily paſs beyond the child's head or ſhoulder, the preſenting part muſt be raiſed up, or gently puſhed to a ſide, that one or both feet may be laid hold of, which muſt be brought as low as poſſible, puſhing up the head and ſhoulders, and pulling down the feet alternately till they advance into the vagina, or ſo low that a nooſe or fillet can be applied; and thus by pulling with the one hand by means of the nooſe, and puſhing with the other, the feet can be brought down and the delivery finiſhed, however difficult.

The method of forming the nooſe is by paſſing the two ends of a tape or garter through the middle when doubled; or, ſhould the garter be thick, by making an eye on one extremity, and paſſing the other end through it; this mounted on the points of the fingers and thumb of the accoucheur's hand, muſt be conveyed into the uterus, paſſed over one or both feet and ankles, and ſecured by pulling at the other extremity.

Caſe 2.—*The ſide.* This is diſcovered by feeling the ribs.

Caſe 3.—*The back.* This is diſcovered by feeling the ſpine.

Caſe 4.—*The belly.* This is known by the funis.

Theſe caſes occur rarely, as the uterus muſt with difficulty admit of ſuch poſitions. When any of theſe parts do preſent, the child ſeldom paſſes any part of the brim of the pelvis, and is, in general, more eaſily turned than in ſeveral poſtures in which it may offer. The belly, from the difficulty with which the legs can be bended backwards, except the child be flaccid, putrid, or before the time, will very ſeldom directly preſent; if ſo, it will be early and readily diſcovered by the prolapſus of the funis, and there will be no great difficulty to come at the feet, and deliver. The rule in all theſe caſes is, to paſs the hand into the womb in the gentleſt manner poſſible, and to ſearch for the feet and bring them down.

CLASS III.

When the child lies longitudinally, in the uterus, with the arm or ſhoulder preſenting, and the head more or leſs over the pubes, or laterally in the pelvis, the feet towards the fundus uteri, the waters evacuated, and uterus contracted round the child's body; theſe are the moſt difficult and laborious of all the caſes of preternatural labours. Here the protruding arm ought, if poſſible, to be reduced, and the head brought into the pelvis; for unleſs the child be very ſmall, it is impoſſible for the head and arm to paſs along together.

In order to effect the reduction of the arm, different inſtruments have been invented; but the hand of the accoucheur is preferable to every thing of this kind, whether of ancient or modern invention. This, conducted by the arm that protrudes, muſt be inſinuated through the vagina into the uterus, as far as the ſhoulder of the child, which if the accoucheur can raiſe up, he will generally ſucceed in reducing the arm. Should this method fail, he muſt attempt to puſh up the fore-arm at the elbow; but, in bending it, muſt be very cautious, to avoid overſtraining or diſlocating the joint. In whatever manner the reduction is accompliſhed, if any method proves ſucceſsful, the arm muſt be retained, till the head, by the force of natural pain, enters the pelvis, and prevents its return; otherwiſe the arm will deſcend as often as it is reduced.

But if the attempts for reduction prove impracticable, the woman muſt be placed on her knees and elbows, and the accoucheur, with great deliberation muſt endeavour gently to ſlide up his hand between the uterus and child as far in the uterus as poſſible, to lift up the head and ſhoulders, and ſearch for and bring down one or both feet, in the beſt manner the various circumſtances of the caſe will admit of. As ſoon as they can be laid hold of, they muſt be gradually brought down into the vagina, ſo low that the nooſe can be applied over them, which muſt be fixed and pulled with the one hand, while the head and upper parts of the body are raiſed and gently puſhed up with the other.

Should the arm have been long protruded without the os externum, much ſwelled, and cold; the waters drained off; the uterus ſtrongly contracted; and the poſition of the child ſuch as to render it impracticable, either to reduce the protruded limb or to ſearch for and bring down the feet; the head if eaſily come at, muſt be opened and extracted with the blunt hook or crotchet; or a crochet muſt be fixed amongſt the ribs, and the breech or feet thus pulled down.

Should the pelvis be very narrow, and unſurmountable difficulties occur, the arm muſt be twiſted off at the elbow, though this expedient is rarely neceſſary; and the delivery muſt in general be accompliſhed as the prudence and judgment of the operator can beſt direct; always remembering, when one life muſt fall a ſacrifice, that the tree muſt be preſerved at the expence of the fruit.

In this, as in other caſes, the ſwelling and coldneſs of the arm, and even want of pulſation in the artery, are not infallible ſigns of the child's death; and ſhould this even be ſo, it makes little difference in the mode of delivery, unleſs that it will lead us to pay all our attention to the mother: For a living child gives no more aſſiſtance in the birth than a dead one, whatever authors have ſaid to the contrary.

When both arms preſent, the delivery muſt be conducted in the ſame manner as when one only preſents. The former caſe is leſs difficult than the latter, as the head ſeldom advances far when both arms fall into the paſſage, ſo that they can either be reduced or there is eaſy acceſs to come at the feet to bring them down and deliver.

CLASS IV.

When the membranes remain entire, till the ſoft parts are ſo much dilated that the hand will readily find admittance; or when the hand can be paſſed within the cavity of the uterus, immediately after the rupture of the membranes, ſo that part of the water may be retained; the delivery may be acompliſhed, in the moſt troubleſome preternatural caſes, with the greateſt ſafety and expedition. But when the waters have been long evacuated, and the uterus, cloſely contracted round the body of the child, the caſe will prove laborious to the operator, painful and dangerous to the mother and child.

When there is reaſon to ſuſpect that the child lies acroſs, which can often be aſcertained, either by feeling the preſenting part through the membranes, or by ſome of the ſigns of preternatural labours already mentioned; the woman ſhould be managed in ſuch a manner, that the membranes may be preſerved entire as long as poſſible: for this purpoſe ſhe ſhould keep quiet in bed, and her poſture ſhould be ſuch as is leaſt favourable for ſtraining, or exerting force during the pain: ſhe ſhould be touched as ſeldom as poſſible, till the os internum be ſufficiently dilated. The acoucheur ſhould then introduce his hand in a conical form, well lubricated, into the vagina, and through the aperture of the internal orifice, inſinuating it between the uterus and the membranes, till it advances almoſt as high as the fundus uteri, when he muſt break the membranes, by pinching ſome part of them between a finger and thumb, or by forcibly puſhing a finger thro' them; he muſt then ſearch for, and endeavour to lay hold of, one or both feet, and deliver.

Should the membranes be ruptured in the attempt he muſt be ready to run up his hand as quickly as can be done with ſafety, when, part of the waters by his arm being retained, the operation of turning will be facilitated. Should the placenta adhere on that ſide of the uterus where the hand is paſſed, it muſt again be withdrawn, and the other hand be introduced in the oppoſite ſide.

Floodings. It has been already obſerved, that a flooding ſeldom proves fatal to the mother before the ſeventh month of pregnancy; after which period, from its duration or exceſs, the life of both the mother and child may ſuffer. Should therefore a flooding attack a woman in the two laſt months of pregnancy, from whatever cauſe it may ariſe, and whether attended with labour-pains or not, if the hæmorrhagy be ſo conſiderable that ſhe is ready to ſink under it, and that cold applications and other means of checking the evacuation ſhall fail, the woman muſt be placed in a proper poſture, her friends prudently appriſed of her danger, and the delivery muſt be immediately performed, by ſtretching the vagina and os uteri, till the hand of the operator can eaſily gain admittance to break the membranes, catch hold of the feet, and extract the child.

If it can poſſibly be prevented, the membranes in flooding caſes ſhould never be broken till the aperture of the uterine orifice will freely admit the hand to paſs, that after the evacuation of the waters, the accoucheur may have it in his power either to make the delivery or not according as the effuſion continues or abates.

Soon after attempting to ſtretch the parts, ſhould the labour-pains come on, the waters begin to be collected, and the uterine hemorrhagy diminiſh the accoucheur muſt then withdraw his hand, and manage the delivery according to circumſtances. And if, for inſtance, the child preſents naturally, the delivery muſt be truſted to nature; otherwiſe, if the flooding continues, or the child preſents acroſs, the accoucheur muſt perſiſt in his work, going on ſlowly, and with the utmoſt

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moſt delicacy, till he be able to reach the feet, to bring them down, and deliver; always remembering, during this proceſs, that the ſtrength of the woman, by proper nouriſhment, be ſupported.

But ſhould the placenta adhere to the cervix, or upon the os uteri, the greateſt danger is to be dreaded; for thus the flooding will commence from the moment the os uteri begins to ſtretch, and will increaſe ſo rapidly, that the woman, if not ſpeedily delivered, muſt inevitably ſink under it. The whole body of the placenta, in ſuch caſes, is ſometimes ſeparated when the labour has made but little progreſs; ſo that the woman will often periſh whether delivery be attempted or not. As this, however, is the only expedient by which her life, and that of the child, can be ſaved; in every caſe where the placenta preſents, which the accoucheur will readily diſcover by the touch of the ſoft pappy ſubſtance of that body, he muſt immediately place the woman in a proper poſture, inſinuate his hand gently by the ſide of the protruding placenta, break the membranes, ſearch for the feet of the child, and bring them down, ſo that the delivery may be finiſhed with all poſſible expedition; for, in this unhappy caſe, a few minutes delay may prove fatal.

The after-birth ought never to be extracted before the child, if it can poſſibly be avoided.

After delivery, time ſhould be given for the uterus to contract, that nature may thus throw off the placenta, which never ought to be hurried away, unleſs the continuance or a recurrence of the hemorrhagy render it neceſſary.

Prolapſus of the funis. Difficulties ariſing from the funis falling down into the vagina, and preſenting along with ſome part of the child, may, in this claſs of the diviſion of preternatural labours, be included.

A preſſure on the chord, in ſuch a degree as to interrupt the circulation, muſt infallibly deſtroy the life of the child: hence a coldneſs and want of pulſation in the chord is the trueſt criterion of the death of the child; and hence, in every caſe where the chord is prolapſed before any bulky part of the child, if the delivery be not accompliſhed with expedition, the child will periſh. This is only to be prevented by replacing the chord, and retaining it above the preſenting part, till this laſt, by the force of labour-pains, be ſo far advanced as to prevent the return of the former; or the child muſt be turned and brought by the feet, provided this can be done with ſafety to the mother. But it is often difficult to ſucceed in the attempt of the one or other; and, if the woman has ſtrong pains, ſuch attempts are not to be hazarded, as the conſequences may prove fatal.

When the accoucheur is thus ſituated between two puzzling difficulties, the preference muſt always be given to the mother. If the child be ſmall, and the pelvis well formed, which may be known by the hiſtory of former deliveries, and if the labour goes on quickly, the child will generally be born alive; but if, on the contrary, the child be above the ordinary ſize, and the pelvis rather narrow, turning will prove a dangerous operation to the mother, and there is little proſpect of ſaving the infant by this means.

Beſides our former diviſion of labours, *plurality of children, monſters, extra-uterine fœtuſes*, and the *Cæſarean operation*, are parts of the ſubject that yet remain to be conſidered.

Plurality of Children.

Chap. IV. *Plurality of Children.*

The caſe of twins often occurs: of triplets ſeldom: of quadruplets rarely: nor is there perhaps a ſingle inſtance, where five or more diſtinct fœtuſes have been found contained in the human uterus, though many ſuch fabulous hiſtories have been recórded by credulous authors.

The ſigns of two or more children, ſuch as the ſudden or extraordinary increaſe of the uterine tumor, motion felt in different parts of the abdomen, &c. are very doubtful and fallacious: this can only be aſcertained after the delivery of one child; and even then a recurrence or continuance of labour-pains is not a certain and infallible criterion; neither is the abſence of pains a ſure indication of the contrary; as many caſes have occurred, where ſeveral days have intervened between the birth of a firſt and ſecond child. The chief ſymptoms to be depended on are, 1ſt, The child being of a ſmall ſize, and the quantity of liquor amnii ſo inconſiderable as not to account for the bulk of the woman in time of pregnancy. 2dly, The bleeding of the funis umbilicalis next the mother. 3dly, The remora of the placenta. 4thly, The uterine tumor not ſenſibly diminiſhed, which, very ſoon after delivery, in ordinary births, will be found gradually ſhifting lower and lower, and will feel at laſt as if a hard circumſcribed tumor like a ball between the umbilicus and pubes. Hence the utility of the general practice of applying the hand externally on the abdomen, in every caſe after delivery; by which an accurate knowledge will be formed of the nature and manner of the uterine contraction. When, from any of theſe circumſtances, there is reaſon to ſuſpect another child, the moſt certain and infallible manner of diſcovering it is, the paſſing of a finger, or the introduction of the hand into the uterus, where another ſet of membranes will be perceived, and probably ſome part of the child preſenting through them.

The poſition of twins or triplets is commonly that which is moſt commodious, and which will occupy the leaſt room in utero: their ſituation is often diagonal; tho' they may preſent in every poſſible poſture. Thus, therefore, the general rules recommended for the delivery of one child, are equally applicable in the caſe of twins, triplets, &c.

It has been the general practice with many, after the birth of one child, to paſs the hand immediately into the the uterus, to break the membranes, catch hold of the feet of the child, and thus deliver. But this is certainly bad practice, whatever authors have ſaid to the contrary. If the woman is healthy, and the child preſents favourably, that is, with the head, breech, or feet, natural pains ought to be waited for, when the child will be expelled by the force of theſe only; failing which, manual aſſiſtance, as in other caſes, muſt be had recourſe to.

It very rarely happens, when the firſt birth is preternatural, that the ſecond membranes are ruptured in making the extraction. Should this prove the caſe, the

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limbs of the children may be confounded, ſo that a leg and an arm, or three legs, or arms of different children, may preſent; which, however will make little difference in the mode of delivery; the accoucheur will endeavour to lay hold of the foot or feet moſt readily within his reach, and will be cautious, in bringing them down, to make ſure they belong to the ſame body.

If the child preſents croſs; if floodings, convulſions, or other dangerous ſymptoms, ſhall take place; if the woman has ſuffered much in the firſt labour; and if, after ſeveral hours, a recurrence of labour-pains does not enſue; the hand muſt then be introduced into the uterus, the membranes muſt be broken, and the child muſt be extracted by the feet; or, if the head remains locked in the pelvis, and, from want of ſtrength in the woman, cannot be expelled, the treatment is the ſame as in other laborious births.

In twin-caſes it may be recommended as a general rule to avoid precipitating the delivery of the ſecond child till the woman ſhall have reſted a proper time, and till, by the contraction of the fundus uteri, the ſecond ſet of membranes occupy the place of the firſt, and be protruded as far as the os externum; when, and not before, the delivery may ſafely be aſſiſted, ſhould circumſtances occur to render ſuch aſſiſtance neceſſary: whereas, by breaking the membranes and evacuating the waters when the child lies high in the uterus, a flooding may be brought on, or a ſpaſmodic conſtriction of the uterus round the body of the child may be occaſioned, which may render the delivery both difficult and dangerous.

The placentæ of twins, triplets, &c. generally adhere, though ſometimes they are diſtinct, and may be thrown off at different times after the birth of the different children; ſo that the practitioner ſhould be on his guard, and never ſhould leave his patient till he makes ſure there be no more children. When a ſecond child is diſcovered, no attempts ought to be made to extract the placenta till after the birth of the remaining child or children; as the woman would be ſubject to flooding, which might prove of fatal conſequence before the uterus could be emptied of its contents.

In caſe of plurality of children, a ſecond ligature ſhould be applied on the funis, on that end next the mother, immediately after the birth of every child; and a gentle compreſſion ſhould be made on the abdomen of the woman after the firſt delivery, which muſt be gradually tightened after every ſucceeding one, to prevent the conſequences of a ſudden removal of uterine preſſure, which is to be dreaded where the diſtenſion has been conſiderable.

The placenta, in ſuch caſes, muſt be managed in much the ſame manner as uſual. In twins, &c. it generally ſeparates with great facility, provided time has been given for the uterus to contract. Both chords ſhould be gently pulled; and when it advances towards the uterine orifice, where, being large and bulky, it commonly meets with conſiderable reſiſtance, it requires the introduction of a finger or two into the vagina for bringing down the edge, after which the body readily follows.

Chap. V. *Monſters*

These are of various ſizes and forms, and, unleſs very ſmall, the poſture favourable, and the woman well made, will prove the cauſe of a difficult and troubleſome delivery. Sometimes a child is monſtrous from a preternatural conformation of parts, ſuch as a monſtrous head, thorax, abdomen, &c. At other times, there is a double ſet of parts, as two heads, two bodies with one head, four arms, legs, &c. But ſuch appearances very ſeldom occur in practice; and, when they do, the delivery muſt be regulated entirely according to the circumſtances of the caſe. A large head, thorax, or belly, muſt be opened. If two bodies united together are too bulky to paſs entire, they muſt be ſeparated; the ſame of ſupernumerary limbs. If the poſture be unfavourable, it muſt be reduced when practicable; otherwiſe the extraction muſt be made with the crotchet, in the beſt manner the circumſtances of the caſe will admit of; always in caſes of danger or difficulty, giving the preference to the ſafety of the mother, without regarding that of the child.

Cæſarean Operation.

Chap. VI. *Cæſarean Operation.*

When the delivery could not be accompliſhed by other means, or when a woman died ſuddenly with a living child in her belly, an operation to preſerve the life of mother and child in the former caſe, and to ſave the child in the latter, has been recommended, and ſucceſsfully performed, by different authors, and in different ages.

This operation is of ancient date; it is the *ſectio Cæſarea* or *partus Cæſareas* of the Latins, and the *hyſterotomia* of the Greeks. Whether it was ever ſucceſsfully performed on the living ſubject amongſt the ancients ſeems uncertain; but that it has been ſucceſsfully practiſed by the moderns on various occaſions, and in ſeveral different countries of Europe, there are ſo many authentic hiſtories on record, that the fact will ſcarce admit of doubt: but as this, like many other ſalutary inſtitutions, has been much abuſed, and in many caſes improperly and injudiciouſly employed, (for ſome of thoſe women who ſurvived the operation, were afterwards ſafely delivered of living children), the circumſtances which render this operation neceſſary demand a very particular inquiry, viz.

1. A narrowneſs, or bad conformation of the bones of the pelvis.
2. Imperforated vagina, or contractions in the vagina, cicatrices, tumors, or calloſities in the os uteri, &c.
3. The eſcape of the child through the uterus when torn.
4. Ventral conceptions.
5. Herniæ of the uterus.
6. The poſition or bulk of the child.

It will be neceſſary carefully to examine theſe different cauſes, in order to ſhow that they are by no means, in every caſe, ſufficiently powerful motives for having recourſe to it.

I. Bad confirmation of the bones of the pelvis. When the hand of the operator cannot be introduced within the pelvis; or, in other words, when its largeſt diameter does not exceed one inch, or one inch and a half, this conformation is perhaps the only one which renders the Cæſarean operation abſolutely neceſſary: happily, however, ſuch a ſtructure very ſeldom occurs in practice; and when it does the accoucheur will readily

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readily diſcover it, by attending to the following circumſtances, and to the common marks of a narrow pelvis. Wherever the capacity of the pelvis is ſo ſtrait as not to admit any part of the child's head to enter, nor two fingers of the accoucheur's hand to conduct proper inſtruments to tear, break down, and extract the child piece-meal; in this caſe, recourſe muſt be had to the Cæſarean ſection; an expedient, though dreadful and hazardous, that will give the woman and child the only chance of life; and which, if timely and prudently conducted, notwithſtanding of the many inſtances wherein it has failed, may be performed with ſome probability of ſucceſs.

It is true, the ſucceſs of the operation in the city of Edinburgh, where it has been done five times, has proved diſcouraging, as none of the women had the good fortune to ſurvive it many days. This, however, is not the fault of the operation, but is to be imputed to the low, weak ſtate of the patients at the time, who had previouſly been ſeveral days in labour, and their ſtrength greatly exhauſted, before the operator was called. Delivery by every other means was utterly impracticable; the operation, though the event was doubtful, alone gave a chance of life; and three of the children by this means were extracted alive.

Mr Hamilton ſurgeon and profeſſor of midwifery in Edinburgh, having been an eye witneſs of the operation the laſt time it was performed here, gives the following account of the caſe which fell under his obſervation.

Eliſabeth Clerk, aged 30, had been married for ſeveral years, became pregnant, and miſcarried in the third month; the expulſion of the abortion occaſioned ſo ſevere a ſtreſs, as actually to lacerate the perinæum. Some time after her recovery, ſhe was irregular, afterwards had one ſhow, of the menſes, again conceived and the child as ſhe imagined, arrived at full time. She was attacked on Monday the 3d of January 1774, about midnight, with labour-pains, which went on ſlowly, gradually increaſing till Saturday the 15th, when ſhe was brought from the country to the Royal Infirmary here. Upon examination, the pelvis ſeemed conſiderably diſtorted; but the body was otherwiſe well ſhaped, though of ſmall ſize; the os externum vaginæ was entirely ſhut up, nor could any veſtige of vagina be obſerved, nor any appearance of labia pudendorum: inſtead of this, there was a ſmall aperture at the ſuperior part of the vulva, immediately under the mons veneris probably about the middle anterior part of the ſymphyſis pubis. This aperture (which had a ſmall proceſs on the ſuperior part, ſomewhat reſembling the clitoris) was no larger than juſt to allow the introduction of a finger; the meatus urinarius lay concealed within it; a conſultation of ſurgeons was called, and the Cæſarean ſection was determined on. Having had no ſtool, nor voided any urine for two days, an injection was attempted to be thrown up: but it did not paſs, nor was it poſſible to puſh the female catheter into the bladder. Mr William Chalmer was the operator in this caſe. At ſix in the evening, he made an inciſion on the left ſide of the abdomen in the ordinary way, through the integumens, till the peritonæum was expoſed; two ſmall arteries ſprung, which were ſoon ſtopped by a ſlight compreſſion: the wound was then continued through the peritonæum into the cavity of the abdomen, when the bladder appeared ſlightly inflamed, much diſtended, reaching with its fundus near as far as the ſcrobiculus cordus; another unſucceſsful attempt was made to paſs the female catheter; at length a male catheter was procured, which was, after ſome difficulty, introduced into the bladder, and the urine evacuated to the quantity of above four pounds, high-ſmelled and fetid. This occaſioned a neceſſary interruption for a few minutes, between making the opening, into the abdomen and uterus; the bladder collapſing, the uterus, which before lay concealed, now came in view, through which an inciſion was made, and a ſtout male child was extracted alive; and immediately afterwards the ſecundines. The uterus contracted rapidly. After cleanſing the wound, the lips were brought together by the quill-ſuture, and dreſſed ſuperficially. The patient ſupported the operation with ſurpriſing courage and reſolution; nor was there more than five or ſix ounces of blood loſt on the occaſion.

Being laid in bed, ſhe complained of ſickneſs, and had a ſlight fit of vomiting; but, by means of an anodyne, theſe ſymptoms ſoon abated: ſhe was affected with univerſal coldneſs over her body, which alſo abated on the application of warm irons to the feet: ſhe then became eaſy, and ſlept for four or five hours. Next morning, the 16th, about two o'clock, ſhe complained of conſiderable pain in the oppoſite ſide, for which ſhe was blooded; and an injection was given, but without effect; for the pain increaſed, ſtretching from the right ſide to the ſcrobiculus cordis; nor did fomentations ſeem to relieve her; her pulſe became frequent, ſhe was hot, and complained of drought. At 7 A. M. the injection was repeated, but with no better ſucceſs; and eight ounces more of blood were taken from the arm; a third injection ſtill failed to evacuate any fœces: the drought increaſed; and the pulſe roſe to 128 ſtrokes in a minute. At 11 A. M. the pulſe became fuller; and the reſpiration much oppreſſed. No ſtool nor urine paſſed ſince the operation. At 12 ſhe was blooded again, when the ſizineſs appeared leſs than formerly. She now took a ſolution of *ſal Glauber. manna and cr. tart.* at ſhort intervals; ſhe vomited a little after the laſt doſe, had a ſoft ſtool, and voided a ſmall quantity of urine. At 3 P M. her pulſe was 136, and ſhe had another ſtool, when thin fæces were evacuated; ſhe was then ordered two ſpoonfuls of a cordial anodyne mixture every ſecond hour: the vomiting now abated; the pulſe became ſmaller and more frequent: ſhe paſſed urine freely; but the pain and oppreſſed breathing increaſed. At ſeven P.M. her pulſe roſe to 142, and became weak and fluttering; ſhe called for bread, and ſwallowed a little with ſome difficulty; her drought was intenſe; the dyſpnœa ſtill increaſed. She was now much oppreſſed, and began to toſs; the pulſe ſunk and became imperceptible; ſhe complained of faintiſhneſs, but on belching wind her breathing was relieved, and the pulſe returned, growing fuller and ſtronger: the pain of the ſide ſtill increaſing, 12 ounces of blood, very ſizy, were taken away; and two glyſters of warm water with oil were injected without effect; at 8 P. M. the pulſe became leſs frequent and ſmaller; ſhe complained much of the pain towards the ſcrobiculus cordis: her breathing was much oppreſſed; her belly was tenſe, and ſwelled as big as before the operation; her pulſe was now ſmall and feeble; ſhe looked ghaſtly, and expired a little after eight, 26 hours after the operation.

It is to be regretted that the relations would not permit the body to be opened.

Since the firſt certain accounts of the operation ſucceſsfully practiſed by a ſow-gelder, on his own wife, in the beginning of the 16th century, there are on record above 70 well-atteſted hiſtories, wherein it has been ſucceſsfully performed: for, of all the caſes related by authors it has not proved fatal to the patient above once in ten or nine inſtances; which evidently ſhows the propriety of the practice, and probability of ſucceſs, both in regard to the mother's own recovery, and for certainly preſerving the life of the child. But it ſhould never be attempted, excepting in thoſe caſes only where it is abſolutely impoſſible to deliver the woman by any other means whatever; for there are pelviſes to be met with, where, without having recourſe to this operation, both mother and child muſt inevitably periſh: ſuch have occurred to many pactitioners, who, from want of reſolution or from ill founded prejudice, have allowed their patients to periſh from neglect, contrary to a well-known maxim in phyſic, That in a deſperate caſe, it is better to employ a doubtful and even deſperate remedy than to abandon the patient to certain and utter ruin. Such, for inſtance, is a caſe related by Saviard, of a girl aged 27, whoſe ſtature was only three feet, who came to lie-in at Paris, in the *Hotel Dieu;* every method but the operation was in vain attempted; both mother and child died. Mauriceau alſo relates the hiſtory of a woman who was left to die, where the aperture of the pelvis was ſo ſmall as not to admit the hand of the accoucheur. And, not to multiply inſtances, Mr De la Roche gives a caſe where the woman had been ſeven days in labour; the child was ſaved by the operation but the woman died the fifth day after, probably from its being too long delayed: the diſtance, in this ſubject, from the lower vertebra lumborum and os pubis, was no more than two fingers breadth. The operation, when the neceſſity is evident, ought therefore to be early performed, that the patient, who from her make and conſtitution is generally delicate and puny, may have every chance of recovery in her favour without being exhauſted by the fruitleſs efforts of a tedious and painful labour, as too often has been the caſe. On theſe occaſions, the prudent accoucheur ſhould call in the advice of his elder brethren of the profeſſion, and, by his cautious and prudent conduct, avoid every cauſe of cenſure or reproach.

Exoſtoſes from the bones of the pelvis is a ſpecies of deformity very rarely met with in practice, and which ſeldom or never takes place to ſuch a degree as to render this operation neceſſary.

II. Conſtriction, calloſity, tumors, &c. about the vagina or os tincæ. The vagina and os tincæ are often affected with conſtrictions from cicatrices, with calloſities and tumors: but it is ſeldom, if ever neceſſary to perform the Cæſarean ſection on this account. Tumors in the vagina may generally be removed with ſafety, even after the commencement of labour, and delivery happily ſucceed; or it may be ſometimes practicable for the accoucheur to paſs his hand by the ſide of the tumor, to turn the child, and deliver. With regard to conſtrictions in the vagina, and calloſities in the os uteri, there are many inſtances where, at the commencement of labour, it was impoſſible to introduce a finger into the vagina; yet the parts have dilated as labour increaſed, and the delivery terminated happily. At other times, the dilatation has begun during pregnancy, and been completed before delivery. There is a hiſtory, for inſtance, in the *Mem. de l'Acad. des Scient.* 1712, of a woman whoſe vagina was no larger than to admit a common writing quill; ſhe had been married at 16, and conceived 11 years after: towards the fifth month of her pregnancy, the vagina began to dilate, and continued to do ſo till full time, when ſhe was ſafely delivered. Guilemeau dilated, and La Mott extirpated, calloſities in the vagina and os tincæ, when the children were ſucceſsfully expelled by the force of natural labour.

Harvey relates a caſe where the whole vagina was grown together with cicatrices; nature, after a tedious labour, made the dilatation, and a large child was born.

La Mott mentions his having delivered three women, who had not the ſmalleſt veſtige of an orifice through the vagina to the uterus. Dr Simpſon cut through a calloſity of an os uteri which was half an inch thick, &c.

Upon the whole, tumors in the vagina, or about the orificium uteri, may be ſafely extirpated without danger of hemorrhagy or other fatal ſymptoms, and the delivery will happily ſucceed; and if the vagina be impervious, the os externum ſhut up, or the labia grown together, the parts ſhould be opened with the ſcalpel, rather than riſk an operation, at beſt in the iſſue doubtful and precarious; an operation never allowable in ſuch caſes, and therefore univerſally improper in diſeaſes or malconformation of the ſoft parts of generation. If the os externum be entirely cloſed, if the cavity of the vagina be entirely filled up, or the paſſage conſiderably obſtructed by tumors, calloſity, or conſtriction from cicatrice, and there is no reaſon to ſuſpect a fault in the pelvis, of which a judgment may be formed by the common marks of deformity, under ſize, or a rickety habit; it is by much the beſt practice to open a paſſage through the vagina, and deliver the woman in the ordinary way. If there be no defect in the pelvis, the head of the child, or any other bulky part that preſents, will advance in this direction, till it meets with a reſiſtance in the ſoft parts: thus the teguments will at length be protruded before the child's head, in form of a tumor, when a ſimple inciſion downwards to the perinæum, in the direction of the anus, will remove the cauſe of difficulty, by relieving the head; the child will afterwards ſafely paſs, and the wound will heal without any bad conſequence.

The ſtate of the pelvis, and progreſs of the labour in theſe caſes, may often be learned by the touch of the finger in ano.

III. Laceratad uterus is another cauſe for which this operation has been recommended. The uterus may be ruptured from violence in making the delivery; or ſuch an accident may happen naturally, either from the croſs preſentation of the child in time of pregnancy, or in time of labour, when the pelvis is narrow; theſe caſes are generally fatal; and it is very ſeldom, if ever, that the life of the mother can be ſaved by the Cæſarian ſection, after the fœtus eſcapes through the torn uterus into the cavity of the abdomen: becauſe it often happens, that inflammation and ſphacelus has affected the parts of the uterus that ſuſtained the preſſure previous to the rupture; or, if otherwiſe, convulſions or other fatal ſymptoms ſoon enſue, from the quantity of blood, waters, &c. poured into the cavity of the abdomen.

When the child cannot be extracted by the natural paſſages, tremors, ſingultus, cold ſweats, ſyncope, and the death of the mother, for the moſt part, ſo quickly follow, that it will at leaſt ſeem doubtful, to a prudent humane practitioner, how far it would be adviſeable, after ſo dreadful an accident, the woman apparently in the agonies of death, raſhly to perform another dangerous operation, even with a view to preſerve the child, till he had waited till the mother recruits or expires.

If part of the child be contained within the uterus, and the feet can be reached, the practice is to deliver by the orifice of the womb; but when the whole fœtus has eſcaped entirely without the uterus, the Cæſarean operation is recommended as the only means of preſerving both mother and child.

If the operation on this occaſion be ever allowable, it may be aſked,

1. At what time muſt it be performed?

2. Would it not have the appearance of inhumanity to have recourſe to this expedient immediately after the uterus burſts, when the woman is ſeemingly ready to expire, although it be the only time when there is a chance of ſaving the child?

3. In moſt caſes where this accident happens, ſhould the Cæſarean ſection be made, is it not highly improbable that the mother will ſurvive ſo terrible a laceration?

5. For if it be done with a view to ſave the mother, in what manner is the extravaſated blood, &c. to be evacuated from the cavity of the abdomen?

What ſeems to make caſes of this kind unfavourable, when the accident happens in time of labour, is,

1*mo*, That here the parts before rupture in moſt caſes are in a gangrenous ſtate.

2*do*. As the rupture is commonly towards the cervix, there is generally a much greater hemorrhagy, by reaſon of the ſlow contraction of the uterus at this place.

3*tio*, The uncertainty whether, or how long, the patient will ſurvive it, ſeems alſo a conſiderable obſtacle to the operation under ſuch diſagreeable circumſtances, *Ne occidiſſe videatur, quem ſors interemet.*

IV. Ventral conceptions is a fourth indication for this operation. Theſe are either in the ovaria, tubes, or cavity of the abdomen, and ſeldom arrive at great ſize; or are retained, very often a long time, without occaſioning much complaint. The iſſue of theſe conceptions has alſo been no leſs various than extraordinary; for after being retained for a great many years in an indolent ſtate, at length abſceſſes or ulcerations have formed, and they have been diſcharged throughout all the different parts of the abdomen.

Moſt women feel pain and violent motion at the time of ordinary delivery in theſe caſes of ventral conception; if therefore the operation be ever neceſſary, now is the proper time to perform it. But in general as the ſeparation of extra-uterine fœtuſes from their involucra may occaſion immediate death in many caſes, from the vaſt hemorrhagy that might enſue from the non-contractile power of the parts to which they adhere; unleſs they point outwardly, or excite the moſt violent ſymptoms, they ought univerſally to be left to nature.

V. Herniæ of the uterus are ſeldom or never ſufficient to induce us to perform the Cæſarian ſection, as the uterus is very rarely influenced in ſuch a manner that the orifice cannot be reached, and the delivery ſucceſsfully made. Many inſtances are to be found among ſurgical authors, where deliveries, under ſuch circumſtances, have been happily performed, without having recourſe to ſo hazardous an expedient. Thus Mauriceau mentions a caſe, where the uterus in a ventral hernia, was puſhed along with the inteſtines above the belly, and contained in a tumor of a prodigious ſize; the woman, however, was delivered at the end of her time in the ordinary way. La Mott relates the hiſtory of a woman in a preternatural labour, whoſe uterus and child hung down pendulous to the middle of her thigh, but whom notwithſtanding, he ſafely delivered: and Ruyſch gives a caſe where the midwife reduced the hernia before delivery; although it was prolapſed as far as the knee, the delivery was ſafely performed, and the woman had a good recovery.

Laſtly, The poſition or bulk of the child.

Since the practice of turning the child and delivering by the feet, and the late improvement of obſtetrical inſtruments, this operation is never to be performed on account of poſition, monſtroſity, or any other obſtacle on the part of the child.

Upon the whole, when the pelvis is faulty to ſuch a degree, that no inſtrument can be conducted to tear and exact the child, this perhaps is the only caſe wherein this operation ſhould be performed on the living ſubject. Inciſions through the teguments of the abdomen to extract extra uterine fœtuſes, or bones of fœtuſes, do not properly fall under the name of *Cæſarean ſection*, as that name implies inciſion of the uterus alſo.

When a woman advanced in pregnancy dies ſuddenly, either by accident or by natural diſeaſe, the Cæſarean ſection is recommended as an expedient to preſerve the life of the child. This is a very proper meaſure, provided the death of the mother be aſcertained; but ſometimes it is a very nice and difficult point to diſtinguiſh between a deliquium and death; and therefore the accoucheur on ſuch an occaſion muſt act with the utmoſt circumſpection. If the operation be delayed but a very ſhort while after the mother expires, it will probably be in vain to make the attempt; for, whatever fabulous ſtories may be related to the contrary, there are few authentic caſes of the fœtus of any animal ſurviving the mother, perhaps an hour; and therefore every thing ſhould be in readineſs to extract the child with all poſſible expedition, after the event of the mother's death. But, in ſuch caſes, the agonies of death often perform the part of labour, and the child is ſometimes thrown off *in articulo mortis*; or the os uteri is ſo much dilated, that there is eaſy acceſs to paſs the hand, turn the child, and deliver. Thus one ſhould be very cautious in having recourſe to this

opera-

Cæſarean Operation.

operation, even in the above circumſtances; which ſhould never be done,

1. Till the death of the mother be aſcertained beyond doubt;

2. Till the ſtate of the os uteri be examined;

3. Till the conſent of the relations be obtained; And,

Laſtly, It need not be undertaken, except where the mother dies ſuddenly, between the 7th and 9th month.

It is unneceſſary where the diſeaſe has been lingering; in ſuch caſes the child commonly dies before the mother.

When it is doubtful whether the child be alive or not, it may be determined by applying the hand on the abdomen of the mother about the time of, and for a little while after, her death, when the life of the child will be diſcovered by its motions and ſtruggling.

Thus having pointed out the different cauſes that determine this operation, it may be obſerved, that it is a frightful and hazardous one; and although performed ſucceſsfully in a number of caſes, yet, in many others it has failed, and the woman has died either immediately or ſoon after. It ſhould never, therefore be undertaken but on extraordinary and deſperate occaſions; and then it is not only adviſeable, but incumbent, on every practitioner to whom ſuch caſes occur.

To conclude, it may not be improper to give a few directions with regard to the method of performing the operation on the living ſubject.

Having emptied the bladder, and evacuated the contents of the inteſtines with repeated emollient glyſters; the patient being encouraged, with proper cordials, and every other requiſite in readineſs, ſhe muſt be placed on a table or bed, with her left ſide gently raiſed with pillows or bolſters, and properly ſecured by aſſiſtants. An inciſion muſt be made with a common convex ſcalpel, beginning rather below the navel at the middle ſpace between it and the ſpine of the os ilium, carrying it obliquely forwards towards this bone, ſo that the wound in length may exceed ſix inches. This external wound is to be carried through the common teguments of the abdomen till the peritonæum is expoſed, when the operator ſhould reſt a little, till the hemorrhagy be entirely abated. He muſt then, with great caution, make a ſmall opening through this membrane, introduce his finger, and upon this a ſcalpel (which is preferable to ſciſſars), and with great expedition make a complete dilatation; he muſt now wipe away the blood with a ſponge, preſs the omentum or inteſtines gently to a ſide, if in the way, and endeavour to diſcover to what part of the uterus the placenta adheres, that it may be avoided in making the inciſion. This may eaſily be known by a thickneſs and ſolidity in the part, which diſtinguiſh it from the reſt of the uterus: it is ſtill more eaſily diſcovered when the membranes are entire. The blood-veſſels are leſs in number, and ſmalleſt in the middle and anterior part of the uterus, which therefore, if the placenta does not interfere, is the proper place for making the inciſion, which muſt be performed with the utmoſt attention, leſt the child ſhould be wounded: if the membranes are entire, more freedom may be uſed, and *vice verſa*. The direction and length of the wound of the uterus muſt be the ſame with the external one. The child muſt now be quickly extracted, and the placenta carefully ſeparated: theſe muſt be given to an aſſiſtant, who will divide the chord, and take care of the child, as the operator's attention muſt be wholly beſtowed on the mother. The coagulated blood, &c. being removed by a ſponge wrung out of warm water (leſt the uterus or inteſtines be protruded, which are very troubleſome to reduce), the lips of the external wound muſt be quickly brought together, and retained by an aſſiſtant till ſecured by a few ſtitches; generally three will be ſufficent: as many needles ſhould be ready threaded with pretty large broad ligatures; the middle ſtitch ought to be made firſt; the needle ſhould be introduced at a proper diſtance, *i. e.* about an inch and one fourth from the ſide of the wound, carrying it firſt from without inwards, and then from within outwards, ſecuring with a double ſlip a knot, to be ready to untie, leſt violent tenſion or inflammation ſhould enſue; under the knot a ſoft compreſs of lint, ſharpee or, rolled plaſter, ſhould be applied, and the whole dreſſings muſt be ſecured by a proper compreſs and bandage. The patient muſt be afterwards treated in the ſame manner as after lithotomy, or any other capital operation.

Cæſarean Operation.

Quæritur, To what cauſe is the unſucceſsful event of this operation to be imputed? When the operation proves fatal, to what immediate cauſe are we to aſcribe the death of the patient? Is it nervous, or uterine irritation, from cutting, that kills? Is it internal hemorrhagy, or the extravaſation of fluids into the cavity of the abdomen? Or are not the fatal conſequences rather to be imputed to the acceſs of the air on the irritable viſcera? This can only therefore be prevented by expoſing theſe parts for as ſhort a ſpace of time as poſſible. Dr Monro, the preſent anatomical profeſſor at Edinburgh, in making experiments on young ſmall animals, ſuch as bitches, cats, frogs, &c. by opening the cavity of the abdomen, and tying the biliary ducts, remarks, that though a large opening into the abdomen be made by inciſion, if the wound be quickly cloſed and ſtitched, the animal will recover, and no bad conſequences follow; but if expoſed a few minutes to the air, dreadful pain ſoon comes on, which the creature expreſſes by the ſevereſt agonies; convulſions at laſt enſue, and death within four or ſix hours after the operation. On opening the abdomen after death, the whole viſcera are found to be in an inflamed ſtate, and univerſally adhering to one another. He has often repeated the experiment, and the ſame appearances as often take place.

May not the analogy here juſtly apply to the human ſubject? And, in performing the Cæſarean operation, ſhould we not be very careful that the viſcera be expoſed as little as poſſible, and that the wound be covered with the utmoſt poſſible expedition?

Chap. VII. *Of the Section of the Symphyſis.*

M. Baudelocque, as has already been obſerved, condemns this operation; and, from what he has advanced, apparently with reaſon. As no theory, however, can be looked upon as thoroughly eſtabliſhed until it be

Section of the Symphyſis.

be confirmed by experience, this gentleman has collected together a number of the principal *facts* relating to this ſubject. He ſuppoſes, that unleſs it has been ſucceſsful in ſaving both the life of the woman and child, the cutting of the ſymphyſis of the pubes cannot by any means be ſaid to have anſwered its purpoſe. It is not ſufficient that the child has ſhown ſome ſigns of life at its birth, and that the mother has ſurvived for ſome time. In this reſpect the Cæſarean operation has the advantage of it, as it always ſaves the life of the child, and it is very rare for the woman to ſink under it immediately. He is of opinion, that there is ſcarcely one of the caſes of this operation, the relation of which may not be juſtly conteſted, or ſolid objections raiſed againſt it; either becauſe the operators have been deceived with regard to the dimenſions of the pelvis and of the child's head, or becauſe they have greatly exaggerated the advantage gained by the ſeparation of the bones.—The firſt and moſt remarkable inſtance of ſucceſs in this operation is of a woman named *Souchot*: but though it is not denied that the woman was delivered, and recovered after the operation, yet it has been ſaid by thoſe who take the contrary ſide, that there was no neceſſity for performing it. It is certain that this woman had been delivered four times before; in all of which caſes the child was killed. M. Baudelocque does not enter into the merits of this queſtion: he conſiders only what advantage could poſſibly be gained by it.

" Whatever degree of ſeparation (ſays he) took place between the oſſa pubis after the ſection of the ſymphyſis, it muſt have augmented the ſize of the paſſage; that is an inconteſtible fact: but how much did it enlarge in the direction in which it was originally too narrow? The ſolution of this problem would be eaſy, if we knew the dimenſions of Souchot's pelvis as well as we know thoſe of her child's head. According to the eſtimation made of it by the phyſicians who performed the operation, the diameter of the pelvis was only two inches and a half in the direction from the pubes to the ſacrum ſuperiorly, and that of the child's head was juſt three inches and a half. The exceſs of the latter was conſequently one inch, as well as the amplitude to be procured to the former. A ſeparation of two inches and a half between the oſſa pubes, the greateſt which it was then thought could be obtained, not being able to give more than ſix lines to the diameter of the pelvis in the aforeſaid direction, they thought to make the remaining ſurplus of the head paſs into the ſeparation between the bones; and, moreover they had the precaution to make the partial protuberances paſs ſucceſſively through the ſtrait, in order to get another line by that means; ſo that by this ſyſtem, the ſection of the pubes produced a reſult of 13 lines at leaſt, conſidering it relatively to delivery. Notwithſtanding this ingenious calculation, and this great product, the paſſage was ſtill found narrow enough to give ſome obſtruction to the child's head, and to endanger its life.

" It ſeems evident that this plan was not formed till after the execution; and that they have only ſought to explain what they muſt have done according to the opinion which they entertained that the diameter of the child's head was an inch larger than that of the pelvis, and not according to what they did and obſerved: becauſe no one had yet determined the product of a ſeparation of two inches and a half between the oſſa pubis, with reſpect to the different diameters of the pelvis, and particularly reſpecting that which goes from before backward; becauſe they did not meaſure the ſeparation as they affirm they did, neither in the caſe of *Souchot* nor in any other; becauſe the accoucheurs of that woman were then agitated, *much agitated*, as they have publicly confeſſed; laſtly, becauſe this great product, and thoſe ſage calculations which we admire in their hiſtory of it, were not then neceſſary. Though they have allowed but two inches and a half to the ſmall diameter of the ſuperior ſtrait, other accoucheurs equally ſkilful have aſſigned it ſix lines more: and they were not deceived if they conſidered it a little diagonally, as the ſmalleſt diameter of the child's head always preſents: that is to ſay, from one of the ſides of the projection formed by the baſe of the ſacrum to the ſymphyſis of the pubes."

Section of the Symphyſis.

Our author now goes on to ſhow at great length, that the pelvis of the woman in queſtion was leſs out of proportion than had been repreſented; that only two lines of enlargement were neceſſary and no more than two were obtained. In like manner, he ſays, that all the other women upon whom M. Sigault operated were equally well formed excepting one named *Veſpres*. This woman died after paſſing five days in great agony. The oſſa pubis were ſeparated about an inch and an half; and in conſequence of this ſeparation, the ſacro-iliac ſymphyſes were plainly injured, as well as the neighbouring parts. On inſpecting the body, theſe were found open, with the perioſteum ſeparated from them: there was alſo a collection of purulent matter of a dark grey colour, extending very far into the cellular tiſſue of the left iliac foſſa, &c.

In this caſe, both the mother and her child periſhed; and M. Baudelocque looks upon it to be ſufficient to ſhow the inefficacy of the operation: and he tells us, that out of five women whom Sigault delivered in this way, one died, and four of the children; but M. le Roy, a more ſucceſsful operator, out of an equal number ſaved all the children. In a caſe related by this gentleman, the oſſa pubis are ſaid to have ſeparated two inches; and by parting the thighs, an opening of near three inches was obtained; but in this caſe again, M. Baudelocque controverts the meaſurements of Le Roy. Another woman named *Du Belloy*, on whom the operation was performed, began to walk on the tenth day after: and this ſeems to be almoſt the only caſe againſt which M. Baudelocque has not ſome objection. He mentions, however, an experiment performed on the body of a woman who had died on the 11th day after the Cæſarean operation had been performed in the linea alba. The body was œdematous, which rendered the caſe more favourable; and a dead child was placed in the belly, after taking out the uterus. The pelvis was only 20 lines in the ſmall diameter, and four inches and a quarter in the tranſverſe. The diameter of the child's head was but three inches five or ſix lines from one parietal protuberance to the other; the trunk was thin, and every part of the body had been preſſed and kneaded, to reſtore as much as poſſible the ſuppleneſs which death had taken away. An attempt was then made

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to bring the child through the pelvis by pulling its feet; but it was found impoſſible thus to diſengage it farther than the breaſt. The ſymphyſis of the pubes was then laid bare by an inciſion of two inches and an half; preſerving, below, the anterior commiſſure of the *labia pudendi;* and above, an extent of 18 or 20 lines under the inferior angle of the Cæſarean operation. The oſſa pubis ſeparated at firſt no more than nine lines; which opening was augmented as gradually as poſſible to 21 lines by ſeparating the thighs, and afterwards it was farther increaſed to two inches and a half by pulling the hips. It was next attempted to bring away the head, which had ſpontaneouſly placed itſelf in the moſt advantageous ſituation: but, though ſeveral gentlemen of the profeſſion employed their ſtrength ſucceſſively at the trunk, and on the lower jaw with two fingers in the mouth, it did not advance a ſingle line; nor would it paſs the ſtrait until M. Baudelocque ſeconded thoſe efforts by preſſing on the head with one hand placed on the belly, and by compreſſing it ſtrongly in the direction of its thickneſs. At the inſtant when it cleared the ſtrait, the inferior angle of the inciſion in the teguments tore to the vulva; and the wound was ſo lengthened towards that of the Cæſarean operation, that thoſe three openings were very near making but one. The ſacro-iliac ſymphyſes, which were already a little open, and the ligaments and perioſteum ruptured by the time that the oſſa pubis were ſeparated 21 lines, now gave way entirely, and with ſo much noiſe as to be diſtinctly heard by every one of the aſſiſtants. The oſſa pubis, after the paſſage of the head, remained at the diſtance of three inches from each other; the angle of the right os pubis was two inches and ſix lines from the centre of the projection of the ſacrum, and the angle of the left os pubis only two inches and three lines; ſo that the diameter of the pelvis was augmented ſeven lines in one way and ten in the other.

From this experiment, M. Baudelocque concludes, that very little advantage can be expected from the operation where the pelvis preſents only 18 or 19 lines, or even 21 ſuperiorly, ſuch as was the pelvis of Belloy. We muſt obſerve, however, that we cannot argue with propriety from a dead to a living ſubject: though if the meaſurements are wrong, as our author *afterwards* ſays, although at firſt he "had nothing particular to object" to her caſe, the whole argument in favour of the operation muſt fall to the ground.

Objections of a ſimilar kind are made to every other caſe which M. Baudelocque relates: And as it is impoſſible for thoſe who were not acquainted with the parties to judge of the propriety or impropriety of the operation, we ſhall content ourſelves with deſcribing from M. Baudelocque the appearances met with in the body of a woman who had died in the operation. "The left *labium* was very much ſwelled and livid; the ſacro-iliac ſymphyſes were of a browniſh colour to the extent of an inch at leaſt, on account of the blood extravaſated under the perioſteum which was detached from them; they were overflown with a purulent and ichorous diſcharge, more abundant on the left ſide than the right; and which ſprung from the bottom of them, through ſeveral openings, which were ſo many rents, whenever the oſſa ilia were moved and preſſed towards the ſacrum; the left ſymphyſis was open five lines, and the right only three; a gangrenous abſceſs was ſeen on the right ſide behind and above the acetabulum, which extended to the anterior and inferior part of the uterus; where there was an eſchar of the ſame nature; an ulcer alſo gangrenous, and in form of a chink, was obſerved in the poſterior part of that viſcus, from the upper part of its neck to the inſertion of the ligament of the ovarium, and it penetrated into its cavity. The diameter of the pelvis was two inches and a half from the pubes to the baſe of the ſacrum; five inches from one ſide to the other, and four and a half from one acetabulum to the ſacro-iliac junction of the oppoſite ſide. The ſection had been made on the left os pubis, which was cut clean, and without the ſmalleſt notch."

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From theſe, and a number of other examples which our limits will not allow us to inſert, our author deduces the following concluſions.

"Though the ſection of the pubes has been thought more ſimple, more eaſy, and certain, than the Cæſarean operation, at a time when experience had not yet demonſtrated the difficulties it might preſent, and the dangers that might follow it, ought we to think the ſame of it at preſent? How many times already has it been neceſſary to have recourſe to the ſaw to ſeparate the oſſa pubis? and how often has it not been found impoſſible to procure any diſtance between them after the ſeparation? How often has this operation produced a free paſſage for the child, whoſe preſervation ought neceſſarily to enter into the plan of the operator, as well as that of the mother, and conſtitute a part of its ſucceſs?

"This new operation will appear more ſimple and leſs painful than the Cæſarean, if we only conſider the extent of the inciſion, and the nature and importance of the parts concerned in it: that is an indiſputable fact. It is only the teguments and the fat which is divided, at moſt only two inches and an half, and the ſymphyſis of the pubes; there are uſually only ſmall veſſels cut, incapable of furniſhing much blood, and the inſtrument does not touch the uterus; the child comes into the world by the way that nature intended, and which the ſection of the pubes renders more or leſs acceſſible; there is no conſiderable hæmorrhagy to be feared, nor thoſe extravaſations of milky and purulent matter which almoſt always mortally injure the interior viſcera which they fall upon; there are no abſolute difficulties in the execution of this operation but what ariſe from the intimate conſolidation of the bones; and it no way expoſes women to ſubſequent hernias which have been ſo frequently ſeen after the Cæſarean operation: this is the idea which its partiſans have had of it, and which the greater part of them ſtill entertain.

"But the ſection of the pubes ſeldom procures the child an eaſy exit; for hitherto the greater part have died in the paſſage, or have been victims, a few minutes after their exit, to the efforts neceſſary to effect it. When the ſeparation of the oſſa pubis has been made, it has not always been poſſible to remove them from each other, on account of the conſolidation of the ilia with the ſacrum; and this caſe, which does not ſeem to be exceedingly rare, and which cannot be known till after the operation, renders it fruitleſs, and cannot diſpenſe us from the Cæſarean operation.

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" If we reflect ever ſo little on the danger to which the child is expoſed in a preternatural labour, where we are obliged to bring it by the feet, and on the ſmall number that then eſcape death, when the mother's pelvis has not, pretty nearly all its natural dimenſions, we diſcover another ſource of accidents which accompanies the ſection of the pubes; and which we doubtleſs ſhould diminiſh, if we could commit the expulſion of the child to the contractions of the uterus, or take hold of the head with the forceps as ſome practitioners have already done: but except in that very ſmall number of caſes, the child has always been extracted by the feet whether the head preſented or not.

" Though this operation very ſeldom ſecures the child's life, even when the pelvis is not exceſſively deformed, it is not then always exempt from the ſevereſt conſequences to the mother. The death of both is certain when that deformity is extreme. The conſequences of a ſpontaneous ſeparation of the oſſa pubis, and of the oſſa ilia and ſacrum, in ſome natural or labourious labours, long ſince announced thoſe which might be expected from this new operation; the example of Veſpres, theſe of the fifth woman on whom M. le Roy performed it, the fourth by M. Cambon, that at Arras, at Duſſeldorp, at Spire, at Lyons, at Gênes; that by M. Riollay, by M. Matthiis, &c. have proved that it was not without cauſe that thoſe accidents were dreaded. A devaſtation in the external parts and the neck of the uterus; an inflammation and gangrene of that viſcus; collections of purulent, ſanious, and putrid matter, in the cellular tiſſue of the pelvis; a hernia of the bladder between the oſſa pubis; echimoſes along the pſoæ muſcles; injury to the canal of the urethra; incontinence of urine, and gangrenes more or leſs profound, &c. form the group of accidents of which this new operation is ſuſceptible. Granting that thoſe of the Cæſarean operation are as formidable for the mother, at leaſt it preſents a certain reſource, exempt from every danger, for the child. Which of the two operations, therefore ought to be preferred?

" Even if we could without inconveniences to the woman obtain a ſeparation of two inches and an half between the oſſa pubis after the ſection of their ſymphyſis, the Cæſarean operation would ſtill be the ſole reſource in caſes of extreme deformity of the pelvis; the ſection of the pubes cannot enter into compariſon with it, except when the ſmall diameter of the ſuperior ſtrait ſhall have, at leaſt, an extent of two inches and an half. Though I ſuſpended my judgement, at the time I publiſhed my firſt edition, concerning the preference to be given to one of theſe two methods, in the latter caſe, till I could procure more poſitive information of the innocence or danger of ſo conſiderable a ſeparation; though I required that man who had no intereſt in vaunting this new method to the detriment of the former; in one word, that its adverſaries ſhould have ſeen a ſeparation of two inches and an half, without a rupture of the ſacro-iliac ſymphyſes, and without inconveniences to make me adopt this new operation; at preſent, better informed on all theſe points, I am not afraid to reject it, and to affirm, that no one has ever ſeparated the oſſa pubis two inches and a half without deſtroying the life of the woman. It has had no ſucceſs but when it has been performed on pelviſes at leaſt two inches three quarters in the ſmall diameter, and when the ſeparation has been limited to much leſs than the point to which they fancied it was carried; in thoſe caſes, in fact, where it was abſolutely uſeleſs; the pelvis being larger ſtill, for I have found it to be more than three inches in ſome of the women. The ſection of the pubes cannot at preſent maintain any compariſon with the Cæſarean operation; at moſt, it might be ſubſtituted for the forceps, in ſome particular caſes only: for it cannot, without great inconveniences, give the pelvis an increaſe of more than two lines from the pubes to the ſacrum ſuperiorly; and that inſtrument may, without danger, reduce the diameter of the child's head as much. But what practitioner would prefer a new operation, which ſeems to be ſurrounded by rocks on every ſide, to one that has been crowned with a thouſand ſucceſſes? If we allow the former any advantages, they would never be more evident than in that ſpecies of locked head mentioned by Roederer, where we cannot (ſays he) introduce any inſtrument between the head and the pelvis, at whatever part we attempt it; in that caſe, it would merit a preference over opening the cranium, the uſe of the crotchets, and the Cæſarean ſection propoſed by the ſame author: it would be preferable alſo, in caſes where the inferior ſtrait is contracted tranſverſely, provided that a ſmall ſeparation were ſufficient to give that diameter the neceſſary extent."

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PART III. OF DISORDERS SUBSEQUENT TO DELIVERY.

CHAP. I. *Of the general Management of Women after delivery*

THE woman being delivered of the child and placenta, let a ſoft linen-cloth, warmed, be applied to the external parts; and if ſhe complains much of a ſmarting ſoreneſs, ſome pomatum may be ſpread upon it. The linen that was laid below her, to ſpunge up the diſcharges, muſt be removed, and replaced with others that are clean, dry, and warm. Let her lie on her back, with her legs extended cloſe to each other; or upon her ſide, if ſhe thinks ſhe can lie eaſier in that poſition, until ſhe recovers from the fatigue: if ſhe is ſpent and exhauſted, let her take a little warm wine or caudle, or, according to the common cuſtom, ſome nutmeg and ſugar grated together in a ſpoon; the principal deſign of adminiſtering this powder, which among the good women is ſeldom neglected, is to ſupply the want of ſome cordial draught, when the patient is too weak to be raiſed, or ſuppoſed to be in danger of retchings from her ſtomach's being overloaded. When ſhe hath in ſome meaſure recovered her ſtrength and ſpirits, let the cloths be removed from the parts, and others applied in their room; and, if there is a large diſcharge from the uterus, let the wet linen below her be alſo ſhifted, that ſhe may not run the riſk of catching cold.

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When the patient is either weak or faintiſh, ſhe ought not to be taken out of bed or even raiſed up to have her head and body ſhifted, until ſhe is a little recruited; otherwiſe ſhe will be in danger of repeated faintings, attended with convulſions, which ſometimes end in death. To prevent theſe bad conſequences, her ſkirt and petticoats ought to be looſened and pulled down over the legs, and replaced by another well warmed, with a broad head-band to be ſlipt in below, and brought up over her thighs and hips; a warm double cloth muſt be laid on the belly, which is to be ſurrounded by the head-band of the ſkirt pinned moderately tight over the cloth, in order to compreſs the viſcera and the relaxed parietes of the abdomen, more or leſs as the woman can eaſily bear it; by which means the uterus is kept firm in the lower part of the abdomen, and prevented from rolling from ſide to ſide when the patient is turned; but the principal end of this compreſſion is to hinder too great a quantity of blood from ruſhing into the relaxed veſſels of the abdominal contents, eſpecially when the uterus is emptied all of a ſudden by a quick delivery. The preſſure being thus ſuddenly removed, the head is all at once robbed of its proportion of blood, and the immediate revulſion precipitates the patient into dangerous lypothymia.

For this reaſon the belly ought to be firmly compreſſed by the hands of an aſſiſtant, until the bandage is applied; or, in lieu of it, a long towel, ſheet, or roller, to make a ſuitable compreſſion; but for this purpoſe different methods are uſed in different countries, or according to the different circumſtances of the patients. The head-cloths and ſhift ought alſo to be changed, becauſe with ſweating in time of labour they are rendered wet and diſagreeable. Several other applications are neceſſary, when the external or internal parts are rent or inflamed; misfortunes that ſometimes happen in laborious and preternatural caſes. We ſhall conclude this chapter with giving ſome neceſſary directions with regard to air, diet, &c.

Although we cannot remove the patient immediately after delivery into another climate, we can qualify the air ſo as to keep it in a moderate and ſalutary temper, by rendering it warm or cold, moiſt or dry, according to the circumſtances of the occaſion. With regard to diet, women, in time of labour, and even till the ninth day after delivery, ought to eat little ſolid food, and none at all during the firſt five or ſeven: let them drink plentifully of warm diluting fluids ſuch as barley-water, gruel, chicken-water, and teas: caudles are alſo commonly uſed, compoſed of water-gruel boiled up with mace and cinnamon, to which, when ſtrained, is added a third or fourth part of white wine, or leſs if the patient drinks plentifully, ſweetened with ſugar to their taſte; this compoſition is termed *white caudle;* whereas, if ale is uſed inſtead of wine, it goes under the name of *brown caudle.* In ſome countries, eggs are added to both kinds; but in that caſe, the woman is not permitted to eat meat or broths till after the fifth or ſeventh day; in this country, however, as eggs are no part of the ingredients, the patient is indulged with weak broth ſooner, and ſometimes allowed to eat a little boiled chicken. But all theſe different preparations are to be preſcribed weaker or ſtronger, with regard to the ſpices, wine, or ale, according to the different conſtitutions and ſituations of different patients; for example, if ſhe is low and weak, in conſequence of an extraordinary diſcharge of any kind, either before or after delivery, or if the weather is cold, the caudles and broths may be made the ſtronger, but if ſhe is of a full habit of body and has the leaſt tendency to a fever, or if the ſeaſon is exceſſively hot, theſe drinks ought to be of a very weak conſiſtence, or the patient reſtricted to gruel, tea, barley and chicken-water, and theſe varied according to the emergency of the caſe.

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Her food muſt be light and eaſy of digeſtion, ſuch as panada, biſcuit, and ſago; about the fifth or ſeventh day ſhe may eat a little boiled chicken, or the lighteſt kind of young meat; but theſe laſt may be given ſooner or later according to the circumſtances of the caſe and the appetite of the patient. In the regimen as to the eating and drinking, we ſhould rather err on the abſtemious ſide than indulge the woman with meat and ſtrong fermented liquors, even if theſe laſt ſhould be moſt agreeable to her palate; for we find by experience that they are apt to increaſe or bring on fevers, and that the moſt nouriſhing and ſalutary diet is that which we have above perſcribed. Every thing that is difficult of digeſtion, or quickens the circulating fluids, muſt of neceſſity promote a fever, by which the neceſſary diſcharges are obſtructed, and the patient's life endangered.

As to the article of ſleeping and watching, the patient muſt be kept as free from noiſe as poſſible, by covering the floors and ſtairs with carpets and cloths, oiling the hinges of the doors, ſilencing the bells, tying up the knockers, and in noiſy ſtreets ſtrowing the pavement with ſtraw; if, notwithſtanding theſe precautions, ſhe is diſturbed, her ears muſt be ſtuffed with cotton, and opiates adminiſtred to procure ſleep; becauſe watching makes her reſtleſs, prevents perſpiration, and promotes a fever.

Motion and reſt are another part of the nonnaturals to which we ought to pay particular regard. By toſſing about, getting out of bed, or ſitting up too long, the perſpiration is diſcouraged and interrupted; and in this laſt attitude the uterus, not yet fully contracted, hangs down, ſtretching the ligaments, occaſioning pain, cold ſhiverings, and a fever; for the prevention of theſe bad ſymptoms, the patient muſt be kept quiet in bed till after the fourth or fifth day, and then be gently lifted up in the bed-cloaths, in a lying poſture, until the bed can be adjuſted, into which ſhe muſt be immediately reconveyed, there to continue, for the moſt part, till the ninth day; after which period women are not ſo ſubject to fevers as immediately after delivery. Some there are who, from the nature of their conſtitutions, or other accidents, recover more ſlowly, and ſuch are to be treated with the ſame caution after as before the ninth day, as the caſe ſeems to indicate; others get up, walk about, and recover, in a much ſhorter time; but theſe may ſome time or other pay dearly for their foolhardineſs, by encouraging dangerous fevers; ſo that we ought rather to err on the ſafe ſide than run any riſk whatſoever.

What next comes under conſideration is the circumſtance of retention and excretion. We have formerly obſerved, that, in time of labour, before the head of the child is locked into the pelvis, if the woman has not had an eaſy paſſage in her belly that ſame day, the rectum and colon ought to be emptied by a glyſter, which will aſſiſt the labour, prevent the diſagreeable excretion of the fæces before the child's head, and enable the patient to remain two or three days after without the neceſſity of going to ſtool. However, ſhould this precaution be neglected, and the patient very coſtive after delivery, we muſt beware of throwing up ſtimulating glyſters, or adminiſtering ſtrong cathartics, leſt they ſhould bring on too many looſe ſtools, which, if they cannot be ſtopt, ſometimes produce fatal conſequences, by obſtructing the perſpiration and lochia, and exhauſting the woman, ſo as that ſhe will die all of a ſudden; a cataſtrophe which hath frequently happened from this practice. Wherefore, if it be neceſſary to empty the inteſtines, we ought to preſcribe nothing but emollient glyſters, or ſome very gentle opener, ſuch as manna, or *elect. lenitivum.* But no excretion is of more conſequence to the patient's recovery than a free perſpiration; which is ſo abſolutely neceſſary, that unleſs ſhe has a moiſture continually on the ſurface of her body for ſome days after the birth, ſhe ſeldom recovers to advantage: her health, therefore, in a great meaſure depends upon her enjoying undiſturbed repoſe, and a conſtant breathing ſweat, which prevents a fever, by carrying off the tenſion, and aſſiſts the equal diſcharge of the lochia; and when theſe are obſtructed, and a fever enſues with pain and reſtleſſneſs, nothing relieves the patient ſo effectually as reſt and profuſe ſweating, procured by opiates and ſudorifics at the beginning of the complaints; yet theſe laſt muſt be more cautiouſly preſcribed in exceſſive hot than in cool weather.

The laſt of the nonnaturals to be conſidered are the paſſions of the mind, which alſo require particular attention. The patient's imagination muſt not be diſturbed by the news of any extraordinary accident which may have happened to her family or friends: for ſuch information hath been known to carry off the labour-pains entirely, after they were begun, and the woman has ſunk under her dejection of ſpirits; and, even after delivery, theſe unſeaſonable communications have produced ſuch anxiety as obſtructed all the neceſſary excretions, and brought on a violent fever and convulſions, that ended in death.

Chap. II. *Of violent Floodings.*

All women, when the placenta ſeparates, and after it is delivered, loſe more or leſs red blood, from the quantity of half a pound to that of one pound, or even two; but ſhould it exceed this proportion, and continue to flow without diminution, the patient is in great danger of her life: This hazardous hemorrhagy is known by the violence of the diſcharge, wetting freſh cloths as faſt as they can be applied; from the pulſe becoming low and weak, and the countenance turning pale; then the extremities grow cold, ſhe ſinks into faintings, and, if the diſcharge is not ſpeedily ſtopped or diminiſhed, is ſeized with convulſions, which often terminate in death.

This dangerous efflux is occaſioned by every thing that hinders the emptied uterus from contracting, ſuch as great weakneſs and laſſitude, in conſequence of repeated floodings before delivery; the ſudden evacuation of the uterus; ſometimes, though ſeldom, it proceeds from part of the placenta's being left in the womb; it may happen when there is another child, or more, ſtill undelivered; when the womb is kept diſtruded with a large quantity of coagulated blood; or when it is inverted by pulling too forcibly at the placenta.

In this caſe, as there is no time to be loſt, and internal medicines cannot act ſo ſuddenly as to anſwer the purpoſe, we muſt have immediately recourſe to external application. If the diſorder be owing to weakneſs, by which the uterus is diſabled from contracting itſelf, ſo that the mouths of the veſſels are left open; or, though contracted a little, yet not enough to reſtrain the hemorrhagy of the thin blood; or if, in ſeparating the placenta, the accoucheur has ſcratched or tore the inner ſurface or membrane of the womb; in theſe caſes, ſuch things muſt be uſed as will aſſiſt the contractile power of the uterus, and hinder the blood from flowing ſo faſt into it and the neighbouring veſſels: for this purpoſe, cloths dipped in any cold aſtringent fluid, ſuch as oxycrate, or red tart wine, may be applied to the back and belly. Some preſcribe veneſection in the arm, to the amount of five or ſix ounces, with a view of making revulſion; if the pulſe is ſtrong, this may be proper; otherwiſe, it will do more harm than good. Others order ligatures, for compreſſing the returning veins at the hams, arms, and neck, to retain as much blood as poſſible in the extremities and head. Beſides theſe applications, the vagina may be filled with tow or linen-rags, dipped in the abovementioned liquids, in which a little allum or ſachar. ſaturni hath been diſſolved; nay ſome practitioners inject proof-ſpirits warmed, or, ſoaking them up in a rag or ſpunge, introduce and ſqueeze them into the uterus, in order to conſtringe the veſſels.

If the flooding proceeds from another child, the retention of the placenta, or coagulated blood, theſe ought immediately to be extracted; and if there is an inverſion of the uterus, it muſt be ſpeedily reduced. Should the hemorrhagy, by theſe methods, abate a little, but ſtill continue to flow, though not in ſuch a quantity as to bring on ſudden death, ſome red wine and jelly ought to be preſcribed for the patient, who ſhould take it frequently, and a little at a time; but above all things chicken or mutton broths, adminiſtered in the ſame manner, for fear of overloading the weakened ſtomach, and occaſioning retching; theſe repeated in ſmall quantities, will gradually fill the exhauſted veſſels, and keep up the circulation. If the pulſe continues ſtrong, it will be proper to order repeated draughts of barley-water, accidulated with elixir vitriol: but if the circulation be weak and languid, extract of the bark, diſſolved in *aq. cinnamomi tenuis*, and given in ſmall draughts, or exhibited in any other form, will be ſerviceable; at the ſame time, lulling the patient to reſt with opiates. Theſe indeed, when the firſt violence of the blood is abated, if properly and cautiouſly uſed, are generally more effectual than any other medicine.

Chap. III. *Of the After-Pains.*

After-pains commonly happen when the fibrous part of the blood is retained in the uterus or vagina, and formed into large clots, which are detained by the ſudden contraction of the os internum and externum, Lochia.

num, after the placenta is delivered: or, if theſe ſhould be extracted, others will ſometimes be formed, though not ſo large as the firſt, becauſe the cavity of the womb is continually diminiſhing after the birth. The uterus, in contracting, preſſes down theſe coagula to the os internum; which being again gradually ſtretched, produces a degree of labour-pains, owing to the irritation of its nerves: in conſequence of this uneaſineſs, the woman ſqueezes the womb as in real labour; the force being increaſed, the clots are puſhed along, and when they are delivered ſhe grows eaſy.—The larger the quantity is of the coagulated blood, the ſeverer are the pains, and the longer they continue.

Women in the firſt child ſeldom have after-pains; becauſe, after delivery, the womb is ſuppoſed to contract and puſh off the clots with greater force in the firſt than in the following labours: after-pains may alſo proceed from obſtructions in the veſſels, and irritations at the os internum. In order to prevent or remove theſe pains, as ſoon as the placenta is ſeparated and delivered, the hand being introduced into the uterus, may clear it of all the coagula. When the womb is felt through the parietes of the abdomen larger than uſual, it may be taken for granted that there is either another child, or a large quantity of this clotted blood; and, which ſoever it may be, there is a neceſſity for its being extracted. If the placenta comes away of itſelf, and the after-pains are violent, they may be alleviated and carried off by an opiate: for, by ſleeping and ſweating plentifully, the irritation is removed, the evacuations are increaſed, the os uteri is inſenſibly relaxed, and the coagula ſlide eaſily along. When the diſcharge of the lochia is ſmall, the after-pains, if moderate, ought not be reſtrained: becauſe the ſqueezing which they occaſion promotes the other evacuation, which is neceſſary for the recovery of the patient. After-pains may alſo proceed from an obſtruction in ſome of the veſſels, occaſioning a ſmall inflammation of the os internum and ligaments; and the ſqueezing thereby occaſioned may not only help to propel the obſtructing fluid, but alſo (if not too violent) contribute to the natural diſcharges.

CHAP. IV. *Of the Lochia.*

WE have already obſerved, that the delivery of the child and placenta is followed by an efflux of more or leſs blood, diſcharged from the uterus, which, by the immediate evacuation of the large veſſels, is allowed to contract itſelf the more freely, without the danger of an inflammation, which would probably happen in the contraction, if the great veſſels were not emptied at the ſame time: but as the fluids in the ſmaller veſſels cannot be ſo ſoon evacuated, or returned into the vena cava, it is neceſſary that, after the great diſcharge is abated, a ſlow and gradual evacuation ſhould continue, until the womb ſhall be contracted to near the ſame ſize to which it had before pregnancy; and to this it attains about the 18th or 20th day after delivery, though the period is different in different women.

When the large veſſels are emptied immediately after delivery, the diſcharge frequently ceaſes for ſeveral hours, until the fluids in the ſmaller veſſels are propelled into the larger, and then begins to flow again, of a paler colour.

Milk-fever

The red colour of the lochia commonly continues till the fifth day, though it is always turning more and more ſerous from the beginning: but, about the fifth day, it flows of a clear, or ſometimes (though ſeldom) of a greeniſh tint; for, the mouths of the veſſels growing gradually narrower by the contraction of the uterus, at laſt allow the ſerous part only to paſs: as for the greeniſh hue, it is ſuppoſed to proceed from a diſſolution of the cellular or cribriform membrane or mucus, that ſurrounded the ſurface of the placenta and chorion; part of which, being left in the uterus, becomes livid, decays, and, diſſolving, mixes with and tinctures the diſcharge as it paſſes along.

Though the lochia, as we have already obſerved, commonly continue till the 18th or 20th day, they are every day diminiſhing in quantity, and ſooneſt ceaſe in thoſe women who ſuckle their children, or have had an extraordinary diſcharge at firſt; but the colour, quantity, and duration, differ in different women: in ſome patients, the red colour diſappears on the firſt or ſecond day; and in others, though rarely, it continues more or leſs to the end of the month: the evacuation in ſome is very ſmall, in others exceſſive: in one woman it ceaſes very ſoon, in another flows during the whole month: yet all of theſe patients ſhall do well.

Some allege, that this diſcharge from the uterus is the ſame with that from a wound of a large ſurface; but it is more reaſonable to ſuppoſe, that the change of colour and diminution of quantity proceed from the ſlow contraction of the veſſels; becauſe, previous to pus, there muſt have been lacerations and impoſthumes, and, in women who have ſuddenly died after delivery, no wound or excoriation hath appeared upon the inner ſurface of the womb, which is ſometimes found altogether ſmooth, and at other times rough and unequal, on that part to which the placenta adhered. The ſpace that is occupied before the delivery, from being ſix inches in diameter, or 18 inches in circumference, will, ſoon after the birth, be contracted to one third or fourth of theſe dimenſions.

CHAP. V. *Of the Milk-fever.*

ABOUT the fourth day, the breaſts generally begin to grow turgid and painful. We have formerly obſerved, that, during the time of uterine geſtation, the breaſts in moſt women gradually increaſe till the delivery, growing ſofter as they are enlarged by the veſſels being more and more filled with fluids; and by this gradual diſtenſion they are prepared for ſecreting the milk from the blood after delivery. During the two or three firſt days after parturition, eſpecially when the woman has undergone a large diſcharge, the breaſts have been ſometimes obſerved to ſubſide and grow flaccid; and about the 3d or 4th day, when the lochia begin to decreaſe, the breaſts ſwell again to their former ſize, and ſtretch more and more, until the milk, being ſecreted, is either ſucked by the child, or frequently of itſelf runs out at the nipples.

Milk-fever

Moſt of the complaints incident to women after delivery, proceed either from the obſtruction of the lochia in the uterus, or of the milk in the breaſts, occaſioned by any thing that will produce a fever; ſuch as catching cold, long and ſevere labour, eating food that is hard of digeſtion, and drinking fluids that quicken the circulation of the blood in the large veſſels; by which means the ſmaller, with all the ſecretory and excretory ducts, are obſtructed.

The diſcharge of the lochia being ſo different in women of different conſtitutions, and beſides in ſome meaſure depending upon the method of management, and the way of life peculiar to the patient, we are not to judge of her ſituation from the colour, quantity, and duration of them, but from the other ſymptoms that attend the diſcharge; and if the woman ſeems hearty, and in a fair way of recovery, nothing ought to be done with a view to augment or diminiſh the evacuation. If the diſcharge be greater than ſhe can bear, it will be attended with all the ſymptoms of inanition; but as the lochia ſeldom flow ſo violently as to deſtroy the patient of a ſudden, ſhe may be ſupported by a proper nouriſhing diet, aſſiſted with cordial and reſtorative medicines. Let her, for example, uſe broths, jellies, and aſſes milk; if the pulſe is languid and ſunk, ſhe may take repeated doſes of the *confect. cardiac.* with mixtures compoſed of the cordial waters and volatile ſpirits: ſubaſtringents and opiates frequently adminiſtered, with the *cort. Peruvian.* in different forms, and auſtere wines, are of great ſervice. On the other hand, when the diſcharge is too ſmall, or hath ceaſed altogether, the ſymptoms are more dangerous, and require the contrary method of cure: for now the buſineſs is to remove a too great plenitude of the veſſels in and about the uterus, occaſioning tenſion, pain, and labour, in the circulating fluids; from whence proceed great heat in the part, reſtleſsneſs, fever, a full, hard, quick pulſe, pains in the head and back, nauſea, and difficulty in breathing. Theſe complaints, if not at firſt prevented, or removed by reſt and plentiful ſweating, muſt be treated with veneſection and the antiphlogiſtic method.

When the obſtruction is recent, let the patient lie quiet, and encourage a plentiful diaphoreſis, by drinking frequently of warm, weak, diluting fluids, ſuch as water-gruel, barley-water, tea, or weak chicken-broth.

Should theſe methods be uſed without ſucceſs, and the patient, far from being relieved by reſt, plentiful ſweating, or a ſufficient diſcharge of the obſtructed lochia, labour under an hot dry ſkin, anxiety, and a quick, hard, and full pulſe, the warm diaphoretics muſt be laid aſide; becauſe, if they fail of having the deſired effect, they muſt neceſſarily increaſe the fever and obſtruction, and recourſe be had to bleeding at the arm or ankle to more or leſs quantity, according to the degree of fever and obſtruction; and this evacuation muſt be repeated as there is occaſion. When the obſtruction is not total, it is ſuppoſed more proper to bleed at the ankle than at the arm; and at this laſt, when the diſcharge is altogether ſtopped, her ordinary drink ought to be impregnated with nitre.

If ſhe is coſtive, emollient and gently opening glyſters may be occaſionally injected; and her breaſts muſt be fomented and ſucked, either by the mouth or pipe-glaſſes. If by theſe means the fever is abated, and the neceſſary diſcharges return, the patient commonly recovers; but if the complaints continue, the antiphlogiſtic method muſt ſtill be purſued. If, notwithſtanding theſe efforts, the fever is not diminiſhed or removed by a plentiful diſcharge of the lochia from the uterus, the milk from the breaſts, or by a critical evacuation by ſweat, urine, or ſtool, and the woman is every now and then attacked with cold ſhiverings; an abſceſs or abſceſſes will probably be formed in the uterus or neighbouring parts, or in the breaſts; and ſometimes the matter will be tranſlated to other ſituations, and the ſeat of it foretold from the part's being affected with violent pains: theſe abſceſſes are more or leſs dangerous, according to the place in which they happen, the largeneſs of the ſuppuration, and the good or bad conſtitution of the patient.

Milk-fever

If, when the pain in the epigaſtric region is violent, and the fever increaſed to a very high degree, the patient ſhould all of a ſudden enjoy a ceſſation from pain, without any previous diſcharge or critical eruption, the phyſician may pronounce that a mortification is begun; eſpecially if, at the ſame time, the pulſe becomes low, quick, wavering, and intermitting: if the woman's countenance, from being florid, turns duſky and pale, while ſhe herſelf, and all the attendants, conceive her much mended; in that caſe, ſhe will grow delirious, and die in a very ſhort time.

What we have ſaid on this ſubject regards that fever which proceeds from the obſtructed lochia, and in which the breaſts may likewiſe be affected: but the milk-fever is that in which the breaſts are originally concerned, and which may happen tho' the lochia continue to flow in ſufficient quantity; nevertheleſs, they mutually promote each other, and both are to be treated in the manner already explained: namely, by opiates, diluents, and diaphoretics, in the beginning; and, the preſcriptions failing, the obſtructions muſt be reſolved by the antiphlogiſtic method deſcribed above. The milk-fever alone, when the uterus is not concerned, is not ſo dangerous, and is much more eaſily relieved. Women of an healthy conſtitution, who ſuckle their own children, have good nipples, and whoſe milk comes freely, are ſeldom or never ſubject to this diſorder, which is more incident to thoſe who do not give ſuck, and neglect to prevent the ſecretion in time; or, when the milk is ſecreted, take no meaſures for emptying their breaſts. This fever likewiſe happens to women who try too ſoon to ſuckle, and continue their efforts too long at one time; by which means the nipples, and conſequently the breaſts, are often inflamed, ſwelled, and obſtructed.

In order to prevent a too great turgency in the veſſels of the breaſts, and the ſecretion of milk, in thoſe women who do not chooſe to ſuckle, it will be proper to make external application of thoſe things which, by their preſſure and repercuſſive force, will hinder the blood from flowing in too great a quantity to this part, which is now more yielding than at any other time: for this purpoſe, let the breaſts be covered with *emp. de minio*, *diapalma*, or *emp. ſimp.* ſpread upon linen, or cloths dipped in camphorated ſpirits, be frequently applied to theſe parts and the arm-pits; while the patient's diet and drink is of the lighteſt kind, and

given,

Evacuations.

given in ſmall quantities. Notwithſtanding theſe precautions, a turgency commonly begins about the third day; but by reſt, moderate ſweating, and the uſe of theſe applications, the tenſion and pain will ſubſide about the fifth or ſixth day, eſpecially if the milk runs out at the nipples: but if the woman catches cold, or is of a full habit of body, and not very abſtemious, the tenſion and pain increaſing, will bring on a cold ſhivering ſucceeded by a fever; which may obſtruct the other excretions, as well as thoſe of the breaſt.

In this caſe, the ſudorifics above recommended muſt be preſcribed; and if a plentiful ſweat enſue, the patient will be relieved; at the ſame time the milk muſt be extracted from her breaſts, by ſucking with the mouth or glaſſes: ſhould theſe methods fail, and the fever increaſe, ſhe ought to be blooded in the arm; and inſtead of the external applications hitherto uſed emollient liniments and cataplaſms muſt be ſubſtituted, in order to ſoften and relax. If, in ſpite of theſe endeavours, the fever proceeds for ſome days, the patient is frequently relieved by critical ſweats, a large diſcharge from the uterus, miliary eruptions, or looſe ſtools mixed with milk, which is curdled in the inteſtines; but ſhould none of theſe evacuations happen, and the inflammation continue with increaſing violence, there is danger of an impoſthume, which is to be brought to maturity, and managed like other inflammatory tumors; and no aſtringents ought to be applied, leſt they ſhould produce ſcirrhous ſwellings in the glands.

As the criſis of this fever, as well as of that laſt deſcribed, often conſiſts in miliary eruptions over the whole ſurface of the body, but particularly on the neck and breaſt, by which the fever is carried off, nothing ought to be given which will either greatly increaſe or diminiſh the circulating force, but ſuch only as will keep out the eruptions. But if, notwithſtanding theſe eruptions, the fever, inſtead of abating, is augmented, it will be neceſſary to diminiſh its force, and prevent its increaſe, by thoſe evacuations we have mentioned above. On the contrary, ſhould the pulſe ſink, the eruptions begin to retreat inwardly, and the morbific matter be in danger of falling upon the viſcera, we muſt endeavour to keep them out by opiates and ſudorific medicines; and here bliſters may be applied with ſucceſs.

Chap. VI. *Of the Evacuations neceſſary at the end of the Month after Delivery.*

Those who have had a ſufficient diſcharge of the lochia, plenty of milk, and ſuckle their own children, commonly recover with eaſe, and, as the ſuperfluous fluids of the body are drained off at the nipples, ſeldom require evacuations at the end of the month; but if there are any complaints from fulneſs, ſuch as pains and ſtitches, after the 20th day, ſome blood ought to be taken from the arm, and the belly gently opened by frequent glyſters, or repeated doſes of laxative medicines.

If the patient has tolerably recovered, the milk having been at firſt ſucked or diſcharged from the nipples, and afterwards diſcuſſed, no evacuations are neceſſary before the third or fourth week; and ſometimes not till after the firſt flowing of the menſes, which commonly happens about the fifth week; if they do not appear within that time, gentle evacuations muſt be preſcribed, to carry off the plethora, and bring down the catamenia.

Explanation of the Plates.

EXPLANATION of the PLATES.

Plate CCCXVI. fig. 1. repreſents a well formed pelvis.

AAAA, The *oſſa ilia*, properly ſo called. *a a*, The iliac foſſæ. *b b b b*, The angle which divides tranſverſely and obliquely, from behind forward, the internal face of the os ilium into two parts, making part of the brim of the pelvis. *c c c c*, The criſtæ of the oſſa ilia. *e e*, Their anterior ſuperior ſpines. *f f*, The angle formed by the internal lip of the criſta of the os ilium, to which is attached a ligament inſerted at the other end in the tranſverſe apophyſis of the laſt lumbar vertebra. *g g*, The inferior angle of the os ilium, which makes part of the acetabulum.

BB, The os iſchium. *h h*, Its tuberoſities. *i i*, Its branches. *k k*, Its poſterior part, making part of the acetabulum.

CC, The body of the os pubis. *l l*, Its angle. *m m*, Its poſterior extremity, making part of the acetabulum. *n n*, Its deſcending branch, uniting with that of the iſchium.

DDD, The os ſacrum. 1, 2, 3, 4, The anterior holes. *o o o*, Its baſe. *p p*, The ſides. *q*, The point. E, The coccyx. F, The laſt lumbar vertebra. *r r*, The tranſverſe apophyſis of that vertebra. *s s*, The ligament proceeding from the tranſverſe apophyſis of the laſt vertebra to the angle of the internal lip of the criſta of the os ilium, marked *f f*. *t t*, Another ligament which deſcends from the ſame apophyſis to the ſuperior edge of the ſacro-iliac ſymphyſis.

GG, The femur or thigh-bone. VV, Its head received in the acetabulum. *u*, *u*, The foramina ovalia.

H, The ſymphyſis of the oſſa pubis. II, The ſacro-iliac ſymphyſes. K, the ſacro-vertebral ſymphyſis.

Fig. 2. repreſents the ſuperior ſtrait of a well formed pelvis.

a a, The iliac foſſæ. *b*, The ſacro-vertebral angle, or projection of the ſacrum. *c*, The laſt lumbar vertebra. *d d*, The lateral parts of the baſe of the ſacrum. *e e*, The ſacro-iliac ſymphyſes. *f f*, The parts over the acetabula. *g*, The ſymphyſis of the pubes.

The lines denote the different diameters of the ſuperior ſtrait. AB, The little diameter. CD, The tranſverſe or great diameter. EF, GH, The oblique diameter, extending from the left acetabulum to the right ſacro-iliac junction.

Fig. 3. ſhows the inferior ſtrait of a well formed pelvis.

a a, The external faces of the oſſa ilia. *b b*, Their anterior ſuperior ſpines. *c c*, Their anterior inferior ſpines. *d d*, The acetabula. *e e*, The foramina ovalia, with the obturator ligaments. *f f*, The iſchiatic tuberoſities. *g g*, The oſſa pubis. *h h*, The branches of the os pubis and iſchium united. *i i*, The ſacrum. *k*, The coccyx. *l l*, The ſacro-iſchiatic ligaments. *m*, The ſymphyſis of the pubes. *n*, Its arch.

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Fig. 1.

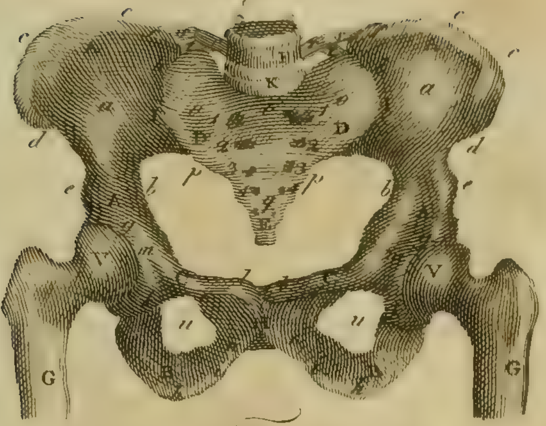


Fig. 4.

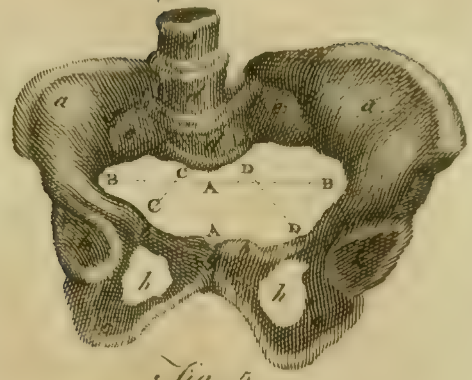


Fig. 2.

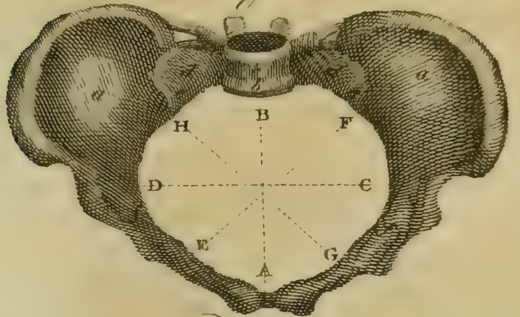


Fig. 3.

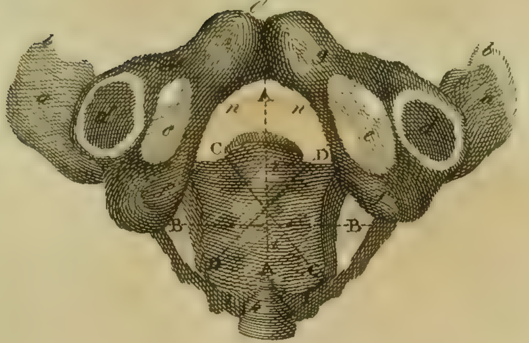


Fig. 5.

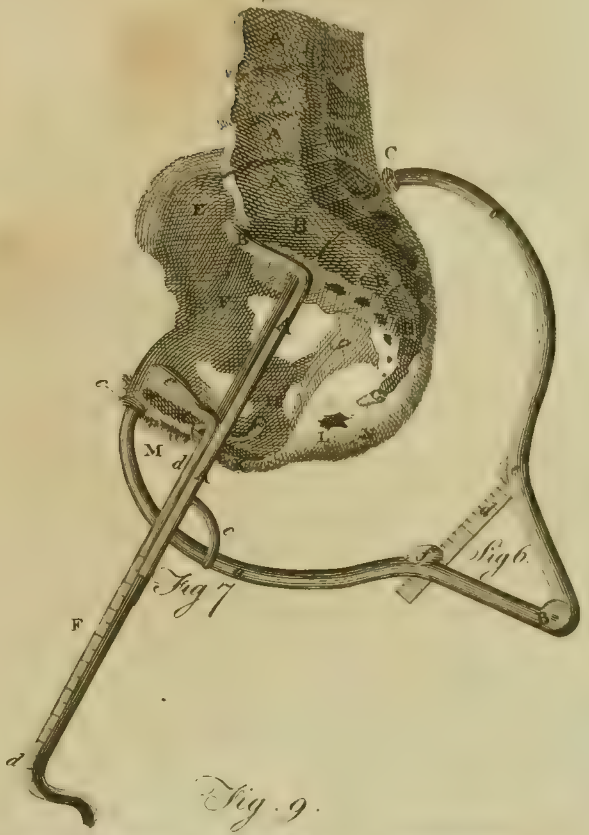


Fig. 8.

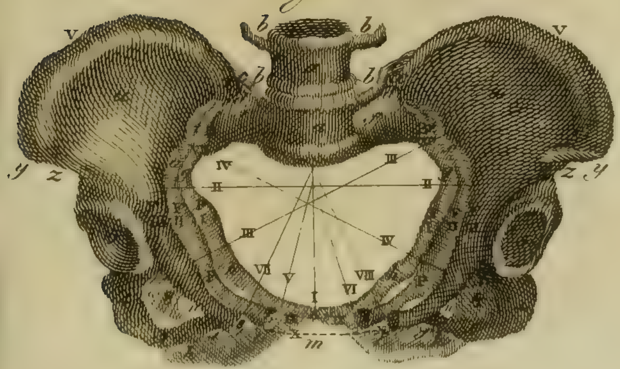
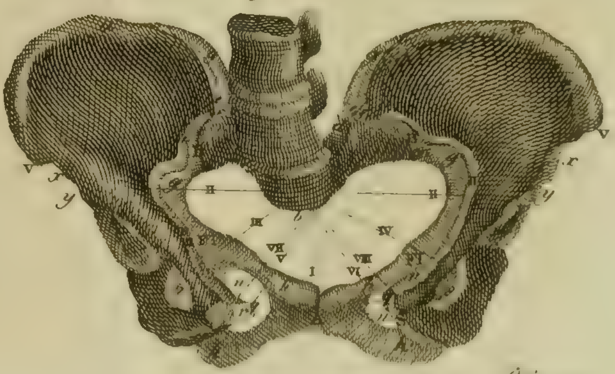


Fig. 9.



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The diameters of the inferior ſtrait are marked by the lines. AA, The *antero-poſterior*, or great diameter. BB, The tranſverſe or little diameter. CC, DD, The oblique diameters.

Fig. 4. ſhows a deformed pelvis.

a a, The oſſa ilia. *b b*, The oſſa pubis. *c c*, The oſſa iſchia. *d d d*, The laſt lumbar vertebræ. *e*, The projection of the ſacrum. *f f*, The ſacro-iliac ſymphyſes. *g*, The ſymphyſis of the pubes. *h h*, The foramina ovalia. *i i*, The branches of the oſſa pubis and iſchia which form the anterior arch of the pelvis. *k k*, The acetabula.

AA, The *antero-poſterior* diameter; the natural length being 14 or 15 lines. BB, The tranſverſe diameter; the natural length four inches and ten lines. CC, The diſtance from the projection of the ſacrum to that point of the margin which anſwers to the left acetabulum, being 13 lines. DD, The diſtance from the ſame point of the ſacrum to that of the margin which anſwers to the right acetabulum, 20 lines.

Fig. 5. ſhows a vertical ſection of the pelvis.

A, A, A, A, The four laſt lumbar vertebræ. B, B, B, The os ſacrum. CC, The coccyx. *d d*, The ſurface reſulting from the ſection of the ſymphyſis of the pubes. E, The left iliac foſſa. F, The left ſide of the ſuperior ſtrait. G, The ſacro-iſchiatic ligament. H, The tuberoſity of the iſchium.

i i, The entrance of the vagina. K, one of the labia pudendi. L, The anus. M, The Mons veneris. N, The left natis.

Plate CCCVII.

Fig. 10. gives a front-view of the uterus *in ſitu*, ſuſpended in the vagina; the anterior parts of the oſſa iſchium, with the oſſa pubis, pudenda, perinæum, and anus, being removed, in order to ſhow the internal parts.

A, the laſt vertebra of the loins. BB, the oſſa ilium. CC, the acetabula. DD, the inferior and poſterior part of the oſſa iſchium. E, the part covering the extremity of the coccyx. F, the inferior part of the rectum. GG, the vagina cut open longitudinally, and ſtretched on each ſide of the collum uteri, to ſhow in what manner the uterus is ſuſpended in the ſame.

HH, part of the veſica urinaria ſtretched on each ſide of the vagina, and inferior part of the fundus uteri.

I, the collum uteri. K, the fundus uteri. LL, the tubi Fallopiani and fimbriæ. MM, the ovaria. NN, the ligamenta lata and rotunda. OO, the ſuperior part of the rectum.

Fig. 11. gives a front view of the uterus in the beginning of the firſt month of pregnancy; the anterior part being removed that the embryo might appear though the amnios, the chorion being diſſected off.

A, the fundus uteri. B, the collum uteri, with as view of the rugous canal that leads to the cavity of the fundus. C, the os uteri.

Fig. 12. In the ſame view and ſection of the parts as in fig 10. ſhows the uterus as it appears in the ſecond or third month of pregnancy.

F, the anus. G, the vagina, with its plicæ.

HH, the poſterior and inferior part of the urinary bladder extended on each ſide; the anterior and ſuperior part being removed.

II, the mouth and neck of the womb, as raiſed up when examining the ſame by the touch, with one of the fingers in the vagina.

KK, the uterus as ſtretched in the ſecond or third month, containing the embryo, with the placenta adhering to the fundus.

Fig. 13. In the ſame view and ſection of the parts with the former figures, repreſents the uterus in the eighth or ninth month of pregnancy.

A, the uterus as ſtretched to near its full extent, with the waters, and containing the fœtus entangled in the funis, the head preſenting at the upper part of the pelvis.

BB, the ſuperior part of the oſſa ilium. CC, the acetabula. DD, the remaining poſterior parts of the oſſa iſchium. E, the coccyx. F, the inferior part of the rectum. GGG, the vagina ſtretched on each ſide. H, the os uteri the neck being ſtretched to its full extent or entirely obliterated. II. part of the veſica urinaria. KK, the placenta, at the ſuperior and poſterior part of the uterus. LL, the membranes. M, the funis umbilicalis.

Fig. 14. gives a front view of twins *in utero* in the beginning of labour.

A, the uterus as ſtretched, with the membranes and waters. BB, the ſuperior parts of the oſſa ilium. CC, the acetabula. DD, the oſſa iſchium. E, the coccyx. F, the lower part of the rectum. GG, the vagina.

H, the os internum ſtretched open about a finger-breadth, with the membranes and waters, in time of labour pains.

II, the inferior part of the uterus, ſtretched with the waters which are below the head of the child that preſents.

KK, the two placentas adhering to the poſterior part of the uterus, the two fœtuſes lying before them, one with its head in a proper poſition at the inferior part of the uterus, and the other ſituated preternaturally with the head to the fundus; the bodies of each are here entangled in their proper funis, which frequently happens in the natural as well as preternatural poſitions.

LLL, the membranes belonging to each placenta.

Fig. 15. ſhows, in a lateral view and longitudinal diviſion of the parts, the gravid uterus when labour is ſomewhat advanced.

A, the loweſt vertebra of the back, the diſtance from which to the laſt mentioned vertebra is here ſhown by dotted lines. CC, the uſual thickneſs and figure of the uterus when extended by the waters, at the latter end of pregnancy. D, the ſame contracted and grown thicker after the waters are evacuated. EE, the figure of the uterus when pendulous. EF, the figure of the uterus when ſtretched higher than uſual which generally occaſions vomitings and difficulty of breathing. G, the os pubis of the left ſide. HH, the os internum. I, the vagina. K, the left nympha. L, the labium pudendi of the ſame ſide. M, the remaining portion of the bladder. N, the anus. OP, the left hip and thigh.

Fig. 16. ſhows the forehead of the fœtus turned backwards to the os ſacrum, and the occiput below the pubes, by which means the narrow part of the head is to the narrow part of the pelvis, that is, between the inferior parts of the oſſa iſchium.

Explanation of the Plates.

A, the uterus contracted cloſely to the fœtus after the waters are evacuated. BCD, the vertrebræ of the loins, os ſacrum and coccyx. E, the anus. F, the left hip. G, the perinæum. H, the os externum beginning to dilate. I, the os pubis of the left ſide. K, the remaining portion of the bladder. L, the poſterior part of the os uteri.

Plate CCCVIII.

Fig. 17. is principally intended to ſhow in what manner the perinæum and external parts are ſtretched by the head of the fœtus, in a firſt pregnancy, towards the end of the labour.

A, the abdomen. B, the labia pudendi. C, the clitoris and its preputium. D, the hairy ſcalp of the fœtus, ſwelled at the vertex, in a laborious caſe, and protruded to the os externum. E, F, the perinæum and anus puſhed out by the head of the fœtus in form of a large tumor. GG, the parts that cover the tuberoſities of the oſſa iſchium. H, the part that covers the os coccygis.

Fig. 18. ſhows in what manner the head of the fœtus is helped along with the forceps, as artificial hands, when it is neceſſary for the ſafety of either mother or child.

AABC, the vertebræ of the loins, os ſacrum, and coccyx. D, the os pubis of the left ſide. E, the remaining part of the bladder. FF, the inteſtinum rectum. GGG, the uterus. H, the mons veneris. I, the clitoris, with the left nymph. X, the corpus cavernoſum clitoridis. V, the meatus urinarius. K, the left labium pudendi. L, the anus. N, the perinæum. QP, the left hip and thigh. R, the ſkin and muſcular parts of the loins.

Fig. 19. ſhows the head of the fœtus, by ſtrong labour-pains ſqueezed into a longiſh form, with a tumor on the vertex, from a long compreſſion of the head in the pelvis.

K, the tumor on the vertex. L, the forceps. M, the veſica urinaria much diſtended with a large quantity of urine from the long preſſure of the head againſt the urethra. N, the under part of the uterus. OO, the os uteri.

Fig. 20. ſhows in the lateral view, the face of the child preſenting and forced down into the lower part of the pelvis, the chin being below the pubes, and the vertex in the concavity of the os ſacrum: the water being likewiſe all diſcharged, the uterus appears cloſely joined to the body of the child.

Fig. 21. ſhows, in a lateral view, the head of the child in the ſame poſition as in the former figure.

AB, the vertebræ of the loins, os ſacrum, and coccyx. C, the os pubis of the left ſide. D, the inferior part of the rectum. E, the perinæum. F, the left labium pudendi. GGG, the uterus.

Fig. 22. gives a lateral internal view of a diſtorted pelvis, divided longitudinally, with the head of a fœtus of the ſeventh month paſſing the ſame.

ABC, the os ſacrum and coccyx. D, the os pubis of the left ſide. E, the tuberoſity of the os iſchium of the ſame ſide.

Fig. 23. gives a ſide view of a diſtorted pelvis, divided longitudinally, with the head of a full grown fœtus ſqueezed into the brim, the parietal bones decuſſating each other, and compreſſed into a conical form.

ABC, the os ſacrum and coccyx. D, the os pubis of the left ſide. E, the tuberoſity of the os iſchium. F, the proceſſus acutus. G, the foramen magnum.

Exlanation of the Plates.

Plate CCCIX.

Fig. 24. ſhows, in a front view of the pelvis, the breech of the fœtus preſenting, and dilating the os internum, the membranes being too ſoon broke.

Fig. 25. is the reverſe of the former, the fore-parts of the child being to the fore part of the uterus.

Fig. 26. repreſents, in a front view of the pelvis, the fœtus compreſſed, by the contraction of the uterus, into a round form, the fore-parts of the former being towards the inferior parts of the latter, and one foot and hand fallen down into the vagina. In this figure, the anterior part of the pelvis is removed, by a longitudinal ſection through the middle of the foramen magnum.

AA, the ſuperior parts of the oſſa ilium. BB, the uterus. C, the mouth of the womb ſtretched and appearing in OOOO, the vagina. D, the inferior and poſterior part of the os externum. EEEE, the remaining part of the oſſa pubis and iſchium. FFFF, the membrana adipoſa.

Fig. 26. repreſents, in the ſame view with fig. 27. the fœtus in the contrary poſition; the breech and fore-parts being towards the fundus uteris, the left arm in the vagina, and the fore-arm without the os externum, the ſhoulder being likewiſe forced into the os uteri.

Plate CCCVI. fig. 8. ſhows a deformed pelvis of which the ſmall diameter of the ſuperior ſtrait is only 2 ½ inches ſeven lines. The figure is triple: F. I. ſhows it in its natural ſtate; F. II. the oſſa pubis ſeparated 18 lines; and F. III. with a ſeparation of two. inches and an half, in order to ſhow the quantity of amplification which the ſection of the ſymphyſis in ſuch a pelvis can produce.

F. I. *a a*, the two laſt lumbar vertebræ; *b b b b*, the tranſverſe apophyſes of theſe vertebræ; *c c*, ligaments proceeding from the tranſverſe apophyſes of the laſt of theſe vertebræ to the middle and poſterior part of the internal lip of the criſta of the os ilium; *d d*, other ligaments deſcending from the ſame apophyſes to the ſuperior part of the ſacro-iliac ſymphyſes; *e*, the projection of the ſacrum; *f f*, the lateral parts of the baſe of the ſacrum; *g g*, part of the oſſa ilia: the reſt of thoſe bones being concealed by F. II. and III.

h h, The bodies of the oſſa pubis; *i i*, their angles.

k k, The oſſa iſchia; *l l*, the branches of theſe bones and of the pubes.

m, The arch of the oſſa pubis at the fore part of the pelvis.

n n, The foramina ovalia concealed by the oſſa pubis of F. II. and III.

A, The ſymphyſis of the oſſa pubis ſeen perſpectively. BB, the ſacro-iliac ſymphyſes.

E. II. *o o*, Part of the oſſa ilia.

PP, The bodies of the pubis; *q q*, their angles; *r r*, their articular facettes ſeen perſpectively; *ſ ſ*, very ſmall portions of the branches of the oſſa pubis.

s, s, The oſſa iſchia appearing behind the foramina ovalia of n° III; *t t*, articular facettes of the oſſa ilia, correſponding to ſimilar ones obſerved at the ſides of the ſacrum.

F. III. *u u*, The oſſa ilia, *v v*, their criſtæ; *x x*, the angle formed by the internal lip of the criſta in the middle and poſterior part of its length; *y y*, the anterior and ſuperior

MIDWIFERY. Plate CCCVII.

Fig. 10.

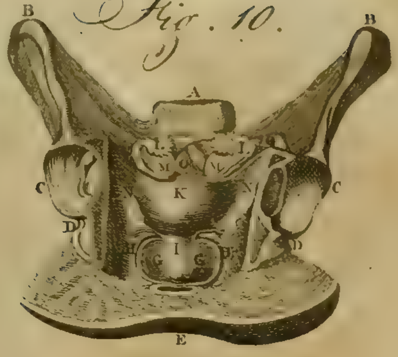

Fig. 13.

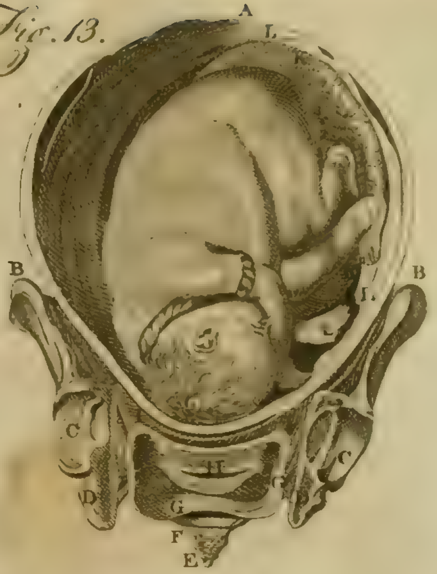

Fig. 11.

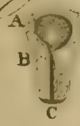

Fig. 12.

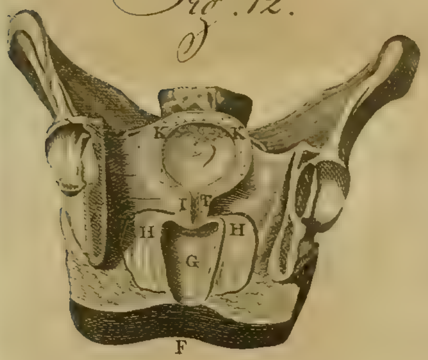

Fig. 14.

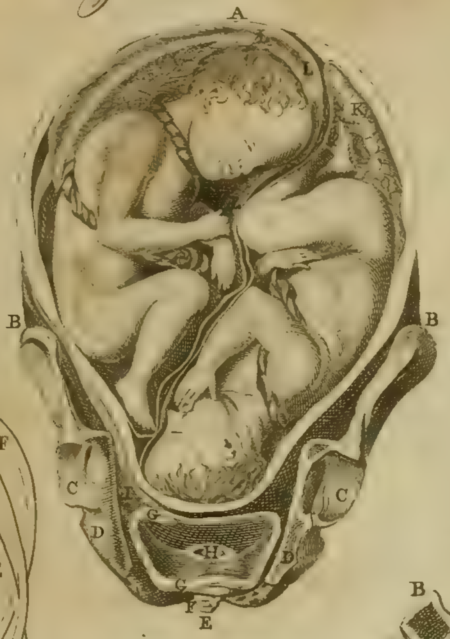

Fig. 15.

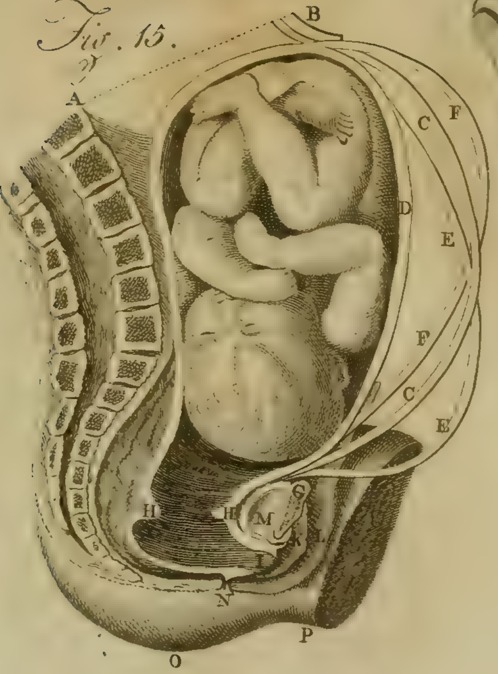

Fig. 16.

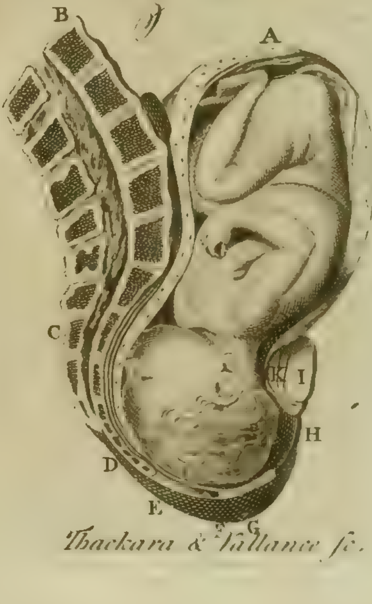

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Fig. 17.

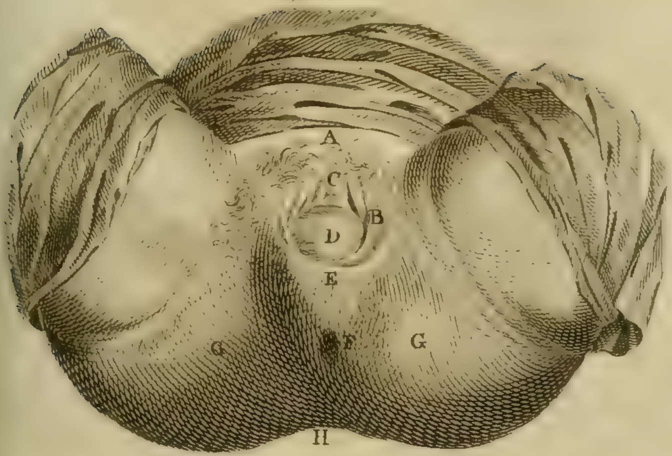


Fig. 18.

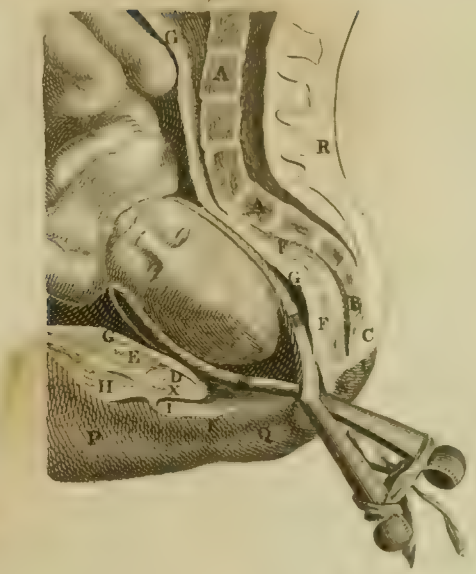


Fig. 19.

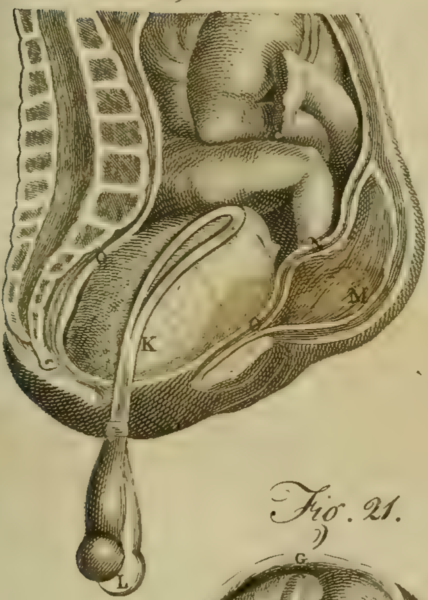


Fig. 20.

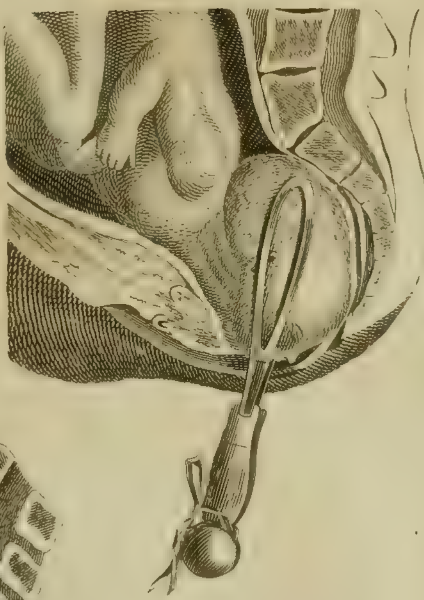


Fig. 21.

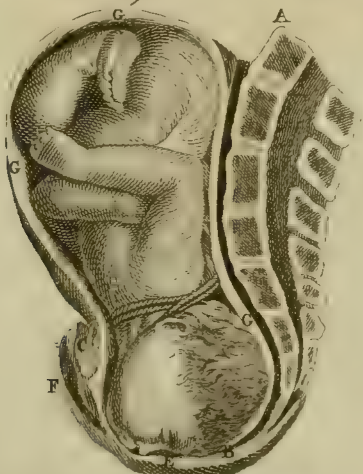


Fig. 22.

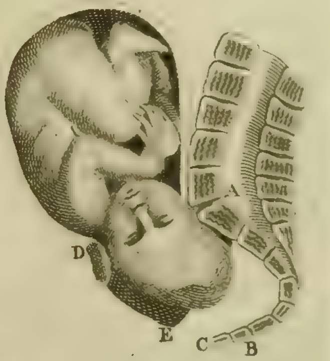
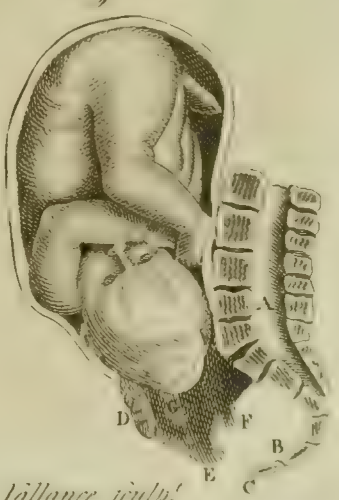


Fig. 23.



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Explanation of the Plates.

ſuperior ſpines of the oſſa ilia; c c, the anterior ſpines of theſe bones; & &, articular facettes of the oſſa ilia, making part of the ſacro-iliac ſymphyſes.

1 1, The oſſa pubis; 2 2, their angles; 3 3, their articular facettes ſeen perſpectively.

4 4, The oſſa iſchia; 5 5, the united branches of the oſſa iſchia and pubis; 6 6, the acetabula.

The lines indicate the natural ſize of the pelvis in the different directions in which they are traced; and their dotted extremities, the amplification which the ſuperior ſtrait acquires in thoſe ſame directions at a ſeparation of eighteen lines, and of thirty lines between the oſſa pubis. Line I. Antero-poſterior diameter of the ſuperior ſtrait, or the diſtance from the pubes to the projection of the ſacrum; two inches ſeven lines. Line II. Tranſverſe diameter of the ſuperior ſtrait, in its moſt extenſive part; four inches ſeven lines. Line III. Oblique diameter of the ſuperior ſtrait, which extends from that point of the ſtrait which correſponds with the anterior edge of the left acetabulum, to the right ſacro-iliac junction; three inches eleven lines. Line IV. The other oblique diameter, which extends from that point of the ſtrait which anſwers to the anterior edge of the right acetabulum, to the left ſacro-iliac ſymphyſis; four inches.

By giving the ſmalleſt attention to the relation of theſe dimenſions to thoſe which the head of a fœtus of the uſual ſize preſents in their direction in time of labour, we ſhall ſee that they are very favourable; except the firſt, which is, ſtrictly ſpeaking, eleven lines too ſhort, being only thirty-one lines in extent: whereas the tranſverſe diameter of the head is commonly forty-two. It is only in this latter direction, and to the extent of eleven lines, that it would be neceſſary to augment the capacity of ſuch a pelvis, to favour delivery. As the greater part of thoſe who have performed this new operation, have only obtained a ſeparation of eighteen lines or thereabouts between the oſſa pubis, it is fixed at that degree in the ſecond figure.

By ſuch a ſeparation in a pelvis perfectly ſimilar to that here repreſented, the angle of each os pubis recedes from the centre of the projection of the ſacrum three lines or very near beyond their natural diſtance from it. (See the lines V. and VI). The antero-poſterior diameter receives but the ſame increaſe, if we conſider it as lengthened to the middle of the dotted line IX. IX. which marks the depth at which it may be preſumed the lateral convexity of the head engages. Both the oblique diameters augment five lines before; and about two lines and an half backward; and the tranſverſe diameter ſeven lines or very nearly.

It is evident that a ſeparation of eighteen lines on ſuch a pelvis cannot remove the diſproportion which exiſts between the ſmall diameter of the ſuperior ſtrait and the ſmall diameter of the child's head; ſince the former augments only three lines, conſidered in the moſt favourable point of view. The amplification which the other diameters receive from a ſimilar ſeparation, is abſolutely uſeleſs; thoſe diameters being naturally large enough.

Suppoſing that the oſſa pubis recede in an equal degree, in ſeparating two inches and an half, the angle of each of them will remove from the centre of the projection of the ſacrum, only ſix lines farther than the diſtance they were from it before; which alſo gives an increaſe of but ſix lines between theſe two points. (See the lines VII. and VIII). The ſmall diameter of the entrance of the pelvis does not gain much more, conſidering it to the middle of the dotted line XX. which marks the bounds beyond which the convexity of the head could not engage between the oſſa pubis, even if the pelvis were diveſted of all its ſoft parts: which does not happen in the ſection of the pubes, for the neck of the bladder, the canal of the urethra, their cellular tiſſue, the anterior ſemicircle of the orifice of the uterus, and the anterior part of the vagina preſent at the opening and before the child's head. At this degree of ſeparation, the tranſverſe diameter augments about thirteen lines, and each oblique diameter nearly fourteen lines: a ſuperfluous increaſe, ſince thoſe diameters, in the pelvis repreſented, have all the length requiſite for delivery.

The poſterior extremities of the oblique diameters, which are dotted and marked with the figures XI and XII, ſhow the ſeparation which is to be feared in the ſacro-iliac ſymphyſes, by ſeparating the oſſa pubis two inches and an half. It was at that degree that Mr Baudelocque obſerved they were open in moſt of his experiments; ſince he could eaſily put the end of his finger, and even of his thumb, into them.

Admitting that the convexity of one of the ſides of the child's head may let itſelf in betwen the oſſa pubis ſeparated to two inches and an half, as far as the dotted line X X, traced on that very convexity, it is evident that that ſeparation cannot procure the relation of dimenſions neceſſary for an eaſy delivery, when the pelvis has originally but two inches ſix or ſeven lines in the ſmall diameter; whence it follows that the ſection of the pubes, ſuppoſing that we could obtain a ſeparation of two inches and an half in the living woman without expoſing her to diſagreeable accidents, would not anſwer in the caſe of a pelvis ſimilar to that repreſented in this plate.

Fig. 9. ſhows a pelvis with only 14 or 15 lines in the ſmall diameter of its entrance, and four inches ten lines in the largeſt. The figure is triple like the former. F. I. repreſents it in its natural ſituation; F. II. with the oſſa pubis ſeparated two inches and a half; and F. III. with a ſeparation of three inches. M. le Roy ſays, that he conſtantly obtained theſe two degrees of ſeparation without any inconvenience.

F. I. *aaa*, The three laſt lumbar vertebræ. *b*, The projection formed by the laſt of thoſe vertebræ, with the baſe of the ſacrum. *cc*, The ſides of the baſe of the ſacrum. *ddd*, The tranſverſe apophyſes of the right ſide of the abovementioned vertebræ. *ee*, A ligament extending from the firſt of thoſe apophyſes to the angle made by the internal lip of the criſta of the os ilium towards its middle and poſterior part. *ff*, Another ligament which depends from that apophyſis to the ſuperior part of the ſacro-iliac ſymphyſis. *gggg*, Part of the os ilium. *hh*, The bodies of the oſſa pubis: *ii*, their angles. *kk*, The oſſa iſchia. *ll*, The branches of the oſſa iſchia and pubis. *m*, The arch of the oſſa pubis. *nn*, The foramina ovalia. A, the ſymphyſis of the oſſa pubis. BB, The ſacro-iliac ſymphyſes.

Explanation of the Plates.

F. II. *o o o o*, Part of the oſſa ilia. *f f*, The articular facettes of the oſſa ilia, making part of the ſacro-iliac ſymphyſes. *p p*, The bodies of the oſſa pubis. *q q*, The angles of the oſſa pubis ſeparated two inches and an half. *r r*, The cartilaginous facettes of the oſſa pubis ſeen perſpectively. *s s*, The branches of the oſſa iſchia and pubes.

F. III. *t t*, The oſſa ilia: *u u*, their criſtæ: *v v*, their anterior ſuperior ſpines: *x x*, their anterior inferior ſpines.

y y, The anterior inferior ſpines of the oſſa ilia of F. II. *z z*, Their anterior articular facettes, making part of the ſacro-iliac ſymphyſis.

& &, The bodies of the oſſa pubis: 1 1, there angles. 2 2, The articular facette of each os pubis ſeen perſpectively. 3 3, The united branches of the oſſa pubis, and iſchia ſeen perſpectively.

4 4, The oſſa iſchia. 5 5, The foramina ovalia behind which is ſeen part of the oſſa iſchia of F. II. 6 6, The acetabula.

The lines indicate the length of the different diameters of the ſuperior ſtrait, in the direction in which they are traced; and their dotted extremities, the amplification to be expected from a ſeparation of two inches and an half, and of three inches.

Line I, The antero-poſterior, or ſmall diameter of the ſuperior ſtrait; one inch two or three lines. Line II, The tranſverſe diameter of the ſame ſtrait: this line, which is four inches ten lines in extent, paſſes under the projection of the ſacrum. Line III, The diſtance from the middle and left lateral part of the projection of the ſacrum, to that point of the margin of the pelvis which anſwers to the anterior edge of the acetabulum on the ſame ſide; one inch. Line IV, The diſtance from the middle and right lateral part of the projection of the ſacrum, to that point of the margin which anſwers to the anterior edge of the acetabulum on the ſame ſide; one inch eight lines.

The relation of theſe dimenſions to thoſe of a child's head of the uſual ſize, is ſuch, that the ſmall diameter of the latter, ſuppoſed always to be three inches and an half, ſurpaſſes the ſmall diameter of the entrance of ſuch a pelvis by 27 or 28 lines. This pelvis would be large enough in the direction of the line II, II.

By ſeparating the oſſa pubis two inches and an half, we augment the breadth of the entrance of the pelvis about three quarters of an inch in the direction of the line II, II: as much, or nearly in the direction of the line III, and only ſix lines in that of the line IV. The angle of each os pubis marked by the letter *q*, recedes from the centre of the projection of the ſacrum, nine or ten lines beyond what it was diſtant from it before the ſeparation of the bones: the entrance of the pelvis increaſes as much in the direction of the line V, and only half an inch in the courſe of the line VI. The ſmall diameter, or the line I, continued to the middle of the dotted line IX, IX, which ſhows the depth to which the child's head may be let in between the oſſa pubis ſeparated two inches and an half, if the pelvis were diveſted of all its ſoft parts: this diameter will then be augmented only ſeven lines; whence we ſee that it would ſtill be an inch and an half, at leaſt, ſhorter than the ſmall diameter of the head of a child of the uſual ſize.

Explanation of the Plates.

The ſection of the pubes would therefore be fruitleſs on ſuch a pelvis, if it could only procure a ſeparation of two inches and an half; which ſeems a very exorbitant one. With more reaſon would it be unſucceſsful, if we could ſeparate the oſſa pubis only 18 lines, as has moſt frequently happened; ſince it could not procure the proportion neceſſary for delivery, even if we could turn that ſeparation entirely to the advantage of the ſmall diameter of the ſuperior ſtrait.

Let us ſee if a ſeparation of three inches could procure that proportion.

By ſeparating the oſſa pubis three inches, we augment the breadth of the pelvis 12 or 13 lines in the direction of the line II, II; 10 lines at moſt in the courſe of the line III; only ſeven in the line IV; about an inch in the line V; and only ſeven lines in the direction of the line VI: the angle of each os pubis recedes an inch farther from the projection of the ſacrum, than the diſtance it was at before the ſeparation of the bones; which augments the opening of the pelvis to the amount of an inch or thereabouts in the direction of the line VII, and only half an inch in the line VIII. The antero-poſterior diameter of the entrance of this pelvis, conſidered as far as the middle of the dotted line X X, which ſhows the greateſt depth to which the child's head could be let in between the oſſa pubis ſeparated three inches, if the pelvis were diveſted of the ſoft parts, increaſes but 10 lines or thereabouts: which cannot remove the diſproportion that exiſted before the ſection of the pubes, between that diameter and the thickneſs of the child's head which muſt paſs in that direction. From whence we ought to conclude that this ſeparation alſo would have no ſucceſs, if the pelvis were as much deformed as that deſigned.

The dotted lines XI and XII, ſhow the ſeparation to be feared in the ſacro-iliac ſymphyſes, by ſeparating the oſſa pubis three inches.

The two other dotted lines, marked by the characters IX, IX, and X, X, ſhow how far the child's head may be let in between the oſſa pubis ſeparated to the two degrees ſtated: they were traced on the convexity of a real head applied behind the oſſa pubis in a pelvis ſtripped of its ſoft parts.

Plate CCCX. fig. 29. ſhows a well formed pelvis, the anterior part of which is taken away, to ſhow one of the tranſverſe poſitions of the face of the child, and explain more fully the mechaniſm of that kind of labour.

a, a, Part of the iliac foſſæ. *b, b,* Part of the criſtæ of the oſſa ilia. *c, c,* Their anterior ſuperior ſpines.

d, d, The iſchiatic tuberoſities. *e, e,* The acetabula. *f, f,* the thickneſs of the oſſa iſchia ſawn through vertically before their tuberoſities.

g, g, The bodies of the oſſa pubis ſawn through before the acetabula.

h, h, h, A circle repreſenting a vertical ſection of the uterus, the anterior part of which is taken away in order to ſhow the child. *i,* The child's chin. *k,* The poſterior extremity of the head. *l, l, l,* The lever applied along the crown of the head, the extremity of it extending beyond the poſterior fontanella.

Explanation of the Plates.

m, The left lateral, and inferior part of the pelvis. *n*, A portion of the right lateral part of the uterine cavity. *p*, The left hand. *p*, *q*, The fore and middle fingers, placed at the ſides of the noſe, and preſſing againſt the upper jaw. R, The right hand graſping the extremity of the lever.

Plate CCCX.

Fig. 30. ſhows the ſame vertical ſection of a pelvis as the laſt; with the child's body entirely diſengaged from it. The head graſped by the forceps is retained at the ſuperior ſtrait, with the occiput over the pubes, and the lower part of the fore-head againſt the projection of the ſacrum.

a, *a*, The laſt lumbar vertebræ. *d*, *d*, The canal of theſe vertebræ, and of the ſacrum. *g*, *g*, *g*, *g*, Spiny tubercles of the vertebræ abovementioned. *b*, *b*, *b*, *b*, The falſe vertebræ of the ſacrum. *c*, *c*, *c*, The coccyx. *e*, *e*, The flatted portion of the anterior face of the ſacrum.

f, The left ſacro-iſchiatic ligament. *h*, The cartilaginous and ligamentous facette of the left os pubis making part of the ſymphyſis.

i, The mons veneris. *k*, *k*, *k*, *k*, A circle repreſenting the ſection of the uterus, the right ſide of which is taken away to ſhow the head and the inſtrument. *l*, *l*, A portion of the placenta attached to the ſuperior and anterior part of the uterus.

m, *m*, *m*, The female branch of the forceps applied on the left ſide of the head, which anſwers to the right ſide of the pelvis. *n*, *n*, The male branch of the forceps, applied at the left ſide of the pelvis, and the right ſide of the head. *o*, Part of the left ſmall ſacro-iſchiatic ligament. P, Part of the left os ilium, the reſt being concealed by the head.

q, The point to which we ought to bring the lower extremity of the forceps, in bringing the head down into the cavity of the pelvis.

R, the point of elevation at which the extremity of the forceps muſt be held, when the head occupies the bottom of the pelvis, after having replaced the face underneath.

Fig. 31. ſhows alſo the vertical ſection of a pelvis; but it is ſuppoſed to have only three inches ſix lines in the ſmall diameter of its entrance. The baſe of the cranium is engaged in it in a tranſverſe direction, the occiput being turned towards the left ſide, and the face to the right ſide; ſo that the greateſt thickneſs of the head is ſtill above the ſtrait.

a, *a*, The two laſt lumbar vertebræ. *b*, *b*, *b*, *b*, *b*, The five falſe vertebræ of the ſacrum. *c*, *c*, *c*, The three pieces of the coccyx. *d*, *d*, The canal of the aforeſaid vertebræ. *e*, *e*, *e*, *e*, Their ſpinous apophyſes. *f*, *f*, Part of the anterior face of the ſacrum.

g, The left ſacro-iſchiatic ligament. *h*, The cartilaginous and ligamentous facette of the left os pubis, making part of the ſymphyſis. *i*, The mons veneris.

k, *k*, *k*, *k*, A circle indicating the ſection of the uterus in the ſame direction as that of the pelvis. *l*, *l*, A portion of the placenta attached to the fundus of the uterus.

m, *m*, *m*, The female branch of the forceps, applied on the left ſide of the child's head, and under the ſymphyſis of the pubes. *n*, *n*, *n*, The female branch of the forceps applied on the right ſide of the head, and before the ſacrum. *o*, A dotted line, in the direction of which the inſtrument muſt be pulled to bring down the head into the pelvis. *p*, The point of elevation at which the forceps muſt be held when the head is brought down to the bottom of the pelvis, after having turned the face into the curve of the os ſacrum.

Explanation of the Plates.

Plate CCCVI. fig. 6. ſhows M. Baudelocque's calipers for meaſuring the antero-poſterior diameter of the ſuperior ſtrait.

a, *a*, The branches of the calipers. B, The hinge which unites the two branches. *c*, *c*, Lenticular buttons which terminate the branches. *d*, A graduated ſcale nine inches long, intended to demonſtrate the thickneſs of the body compriſed between the two branches. This ſcale is contained in a deep groove cut lengthwiſe in the branch of the calipers, from the letter *e*, to the hinge B; and paſſes through a mortoiſe made in the other branch under the letter *f*. *e*, The place where the ſcale is united by a kind of a hinge. *f*, A little ſcrew with a flat head, deſigned to fix the ſcale, while we calculate the thickneſs of the body compriſed between the two branches.

Fig. 7. ſhows the pelvimeter of M. Coutonli developed in the pelvis.

A, A, The firſt branch; whoſe ſquare, B, is applied to the projection of the ſacrum. C, *c*, A kind of hooks intended to keep the firſt branch in its place, while we introduce and develope the ſecond. This has a dove-tailed groove, in which the body of the ſecond branch is lodged and moved. *d*, *d*, the ſecond branch of the inſtrument, whoſe ſquare *e* is placed againſt the ſymphyſis of the pubes. F, a ſcale four inches long, graduated in the branch *d*, *d*; and intended to ſhow the degree of opening from the pubes to the ſacrum.

Plate CCCVIII. fig. 21. repreſents in a lateral view of the pelvis, the method of extracting, by means of a curved crotchet, the head of the fœtus, when left in the uterus, after the body is delivered and ſeparated from it; either by its being too large, or the pelvis too narrow.

ABC, the os ſacrum and coccyx.

D, the os pubis of the left ſide.

EE, the uterus.

F, the locking part of the crotchet.

g, *h*, *i*, The point of the crotchet on the inſide of the cranium.

Plate CCCIX.

Fig. 32. repreſents the forceps and blunt hook.

A, the ſtraight forceps, in the exact proportion as to the width between the blades, and length from the points to the locking part; the firſt being two and the ſecond ſix inches, which, with three inches and a half (the length of the handles), make in all 11 inches and a half.

B repreſents the poſterior part of a ſingle blade, in order to ſhow the width and length of the open part of the ſame, and the form and dimenſions of the whole.

C, the blunt hook, which is uſed for three purpoſes. 1. To aſſiſt the extraction of the head, after the cranium is opened with the ſciſſars, by introducing the ſmall end along the ear on the outſide of the head to above the under-jaw, where the point is to be fixed; the other extremity of the hook being held with one hand, whilſt two fingers of the other are to be introduced into the foreſaid opening, by which hold the head is to be gradually extracted. 2. The ſmall end

Explanation of the Plates.

Explanation of the Plates.

is uſeful in abortion, in any of the firſt four or five months, to hook down the ſecundines, when lying looſe in the uterus, when they cannot be extracted by the fingers or labour-pains, and when the patient is much weakened by floodings. 3. The large hook at the other end is uſeful to aſſiſt the extraction of the body, when the breech preſents; but ſhould be uſed with great caution, to avoid the diſlocation or fracture of the thigh.

Fig. 33. A, repreſents the whale-bone fillet, which may be ſometimes uſeful in laborious caſes, when the operator is not provided with the forceps, in ſudden and unexpected exigencies.

BB, two views of a peſſary for the prolapſus uteri. After the uterus is reduced, the large end of the peſſary is to be introduced into the vagina, and the os uteri retained in the concave part, where there are three holes to prevent the ſtagnation of any moiſture. The ſmall end without the os externum has two tapes drawn through the two holes, which are tied to four other tapes, that hang down from a belt that ſurrounds the woman's body, and by this means keep up the peſſary. This peſſary may be taken out by the patient when ſhe goes to bed, and introduced again in the morning; but as this ſometimes rubs the os externum, ſo as to make its uſe uneaſy, the round kind, marked C, are of more general uſe. They are made of wood, ivory, or cork, (the laſt covered with cloth and dipped in wax): the peſſary is to be lubricated with pomatum, the edge forced through the paſſage into the vagina, and a finger introduced in the hole in the middle lays it acroſs within the os externum. They ought to be larger or ſmaller, according to the wideneſs or narrowneſs of the paſſage, to prevent their being forced out by any extraordinary ſtraining.

DD gives two views of a female catheter, to ſhow its degree of curvature and different parts.

Fig. 34. *a*, repreſents a pair of curved crotchets locked together in the ſame manner as the forceps. The dotted lines along the inſide of one of the blades repreſent a ſheath contrived to guard the point till it is introduced high enough: the ligature at the handles marked with two dotted lines is then to be untied, the ſheath withdrawn, and the point being uncovered is fixed as in fig. 21. (Pl. cccviii.)

b, Gives a view of the back-part of one of the crotchets, which is 12 inches long.

c, A front view of the point, to ſhow its proportional length and breadth.

d, The ſciſſars for perforating the cranium in very narrow and diſtorted pelviſes. They ought to be made very ſtrong, and at leaſt nine inches in length, with ſtops or reſts in the middle of the blades, by which a large dilatation is more eaſily made.

Plate CCCX. fig. 35. gives an anterior view of the improved lever by Roonhuyſen, an inſtrument now come into conſiderable reputation. Fig. 36. ſhows the ſame in profile. Fig. 37. the lever recommended by M. Baudelocque. Fig. 38. one of the blades of a lever recommended by M. Herbinaux, fixed in the handle. Fig. 39. an anterior view of the ſame blade with the ſtrap. Fig. 40. the ſpout of the ſyringe, when the inſtrument is uſed for injecting oil, or any other liquid into the uterus. The following is a general deſcription of Roonhuyſen's lever, with the method of uſing it, as given by M. Preville, and added to his edition of Smellie's Midwifery. "The lever is an oblong piece of iron, 11 inches long, one broad, and about an eighth of an inch in thickneſs, it is ſtraight in its middle for four inches, and becomes gradually curved at each extremity: the curves are of different lengths and depths; the edges are rounded; and the extremities for the ſpace of an inch, and alſo the middle of the inſtrument, are directed to be covered with plaſter, and then the whole of it to be ſheathed with thin dogſkin; taking care to avoid inequalities or folds, which might injure the woman or child. In uſing it, the accoucheur muſt introduce the fore-finger of his left hand into the vagina near the anus, to ſerve as a guide for the inſtrument, which muſt now be gently inſinuated between his finger and the head of the child, taking care that no part of the uterus be included between the lever and the head. The inſtrument muſt then be moved to the right and to the left, to find where there is the greateſt ſpace, and in ſome degree to looſen and diſengage the head; and then gradually carried round, until it comes under the pubes, lifting the end of it from time to time, to obtain a freer paſſage. The handle of it muſt now be raiſed, and the inſtrument gently ſhifted about, until the occiput is exactly lodged in its curve. The more completely and exactly the curve touches and embraces the head, the more ſpeedily and eaſily the delivery will be effected. The inſtrument being thus firmly and equally applied to the head, the accoucheur muſt ſlowly and uniformly raiſe the handle with his right hand, while with his left he preſſes the middle of it downward; by this means the coccyx is forced backward, and the lower part of the pelvis is enlarged. By continuing to raiſe the handle of the lever and to preſs down its middle or centre, the head of the child is made to deſcend into the dilated cavity of the vagina: and this is commonly effected in a few minutes; when the left hand muſt be applied firmly againſt the anus and perinæum, forcing thoſe parts upwards and forwards towards the orifice of the vagina, to prevent laceration; for which purpoſe alſo the whole operation muſt be performed ſlowly and cautiouſly, imitating as much as poſſible a natural labour."

"We found (add the authors of the paper,) a cord fixed round one of the ends of the inſtrument, about the middle of the curve. This cord, we imagine, ſerved no other purpoſe than to point out the end of the inſtrument commonly made uſe of, or to meaſure the length of the part introduced."

END OF THE ELEVENTH VOLUME.

Fig. 24

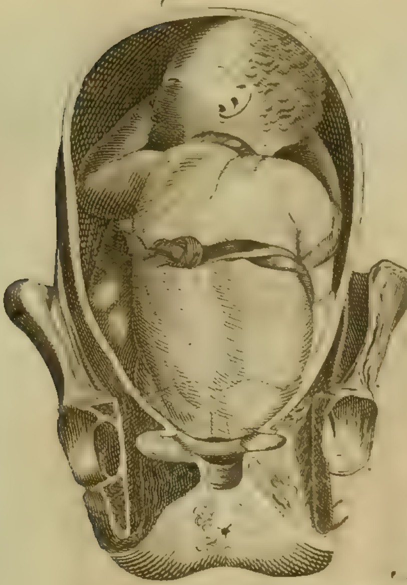


Fig. 25

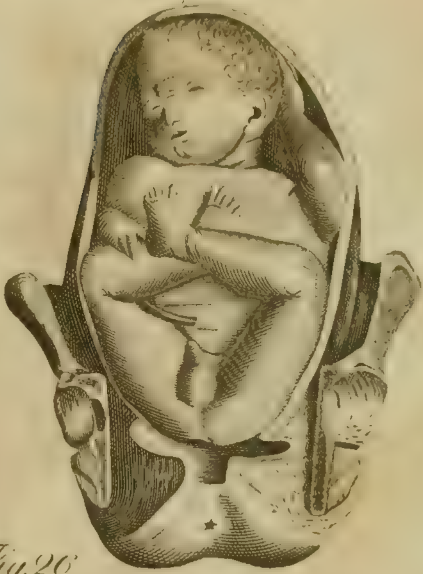


Fig. 32

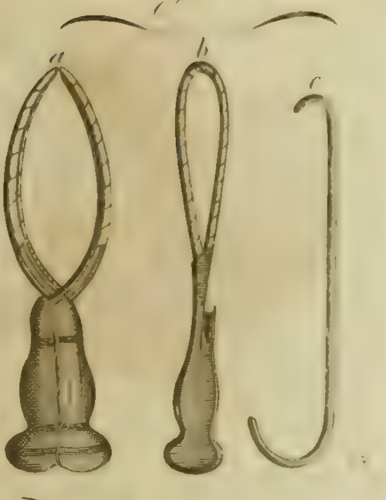


Fig. 26

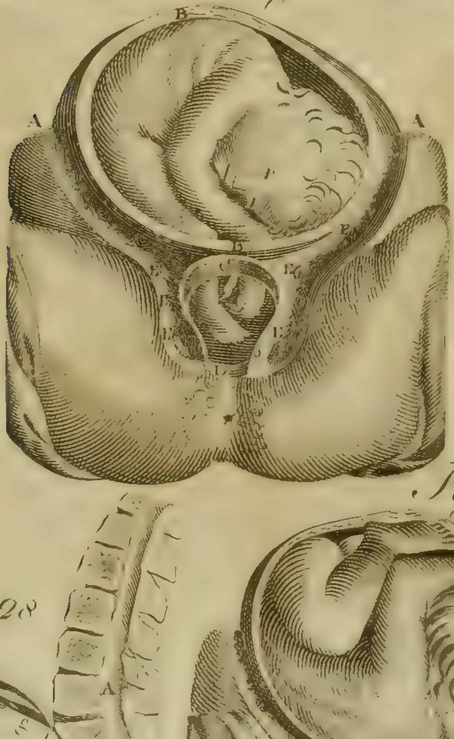


Fig. 33

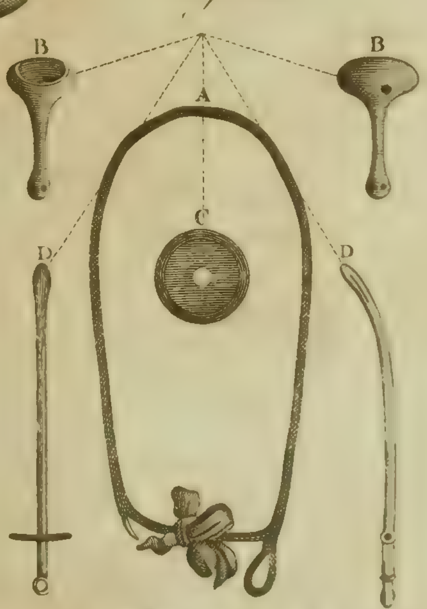


Fig. 27

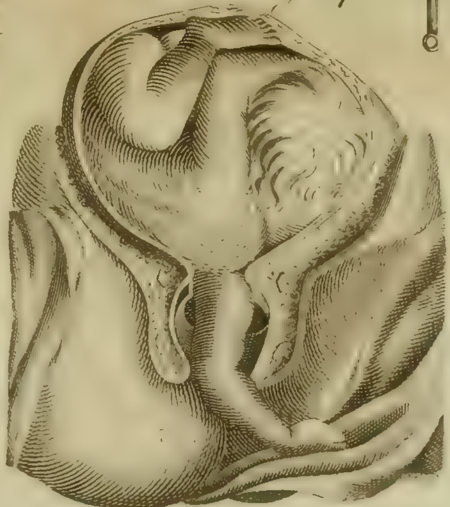


Fig. 28

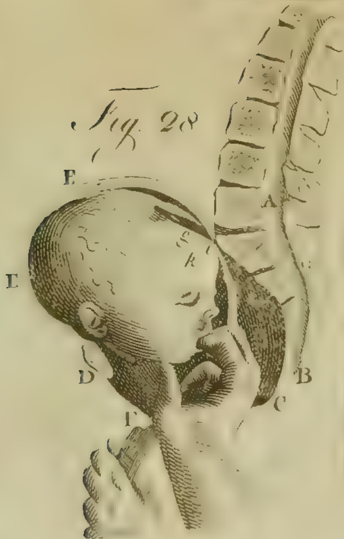
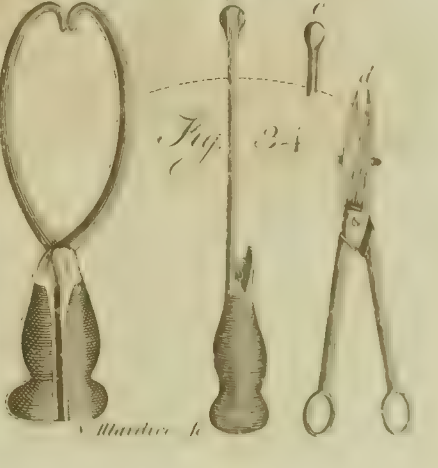


Fig. 34



Mardoe sc

MIDWIFERY. Plate CCCX.

Fig. 35.

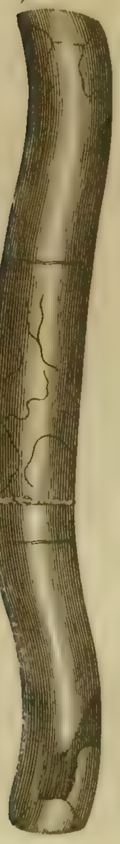


Fig. 36.

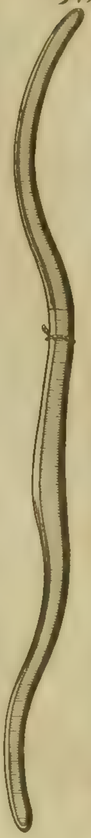


Fig. 38.

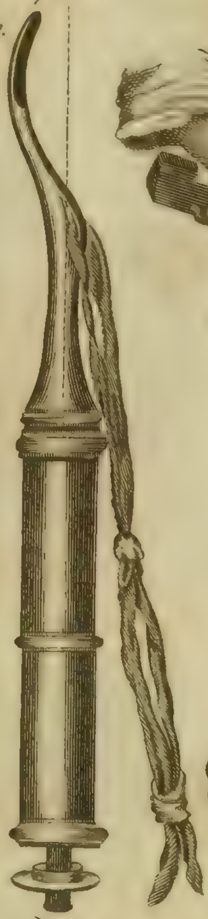


Fig. 29.

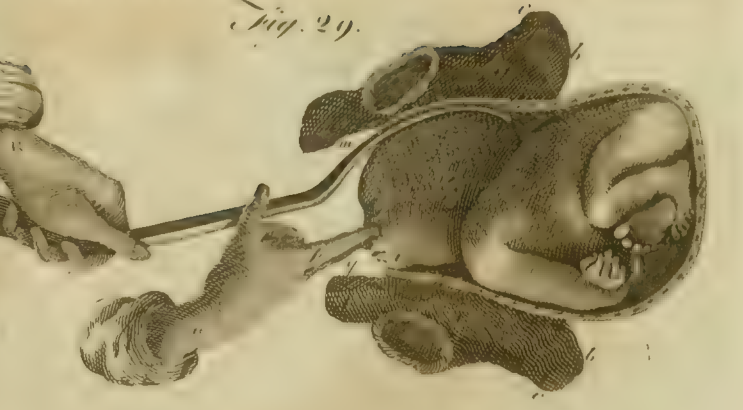


Fig. 30.

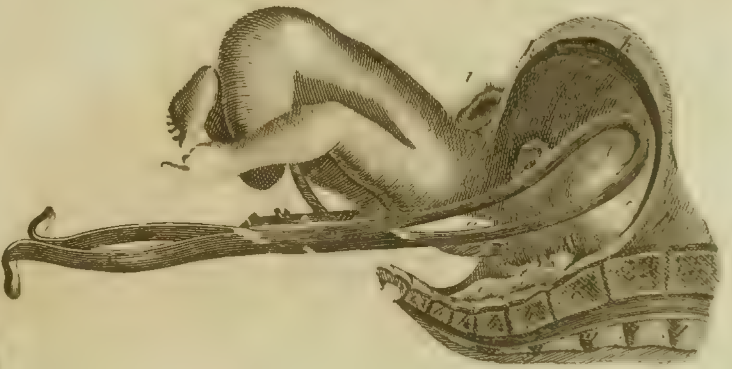


Fig. 39.

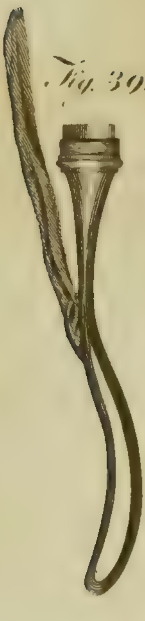


Fig. 40.

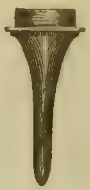


Fig. 37.

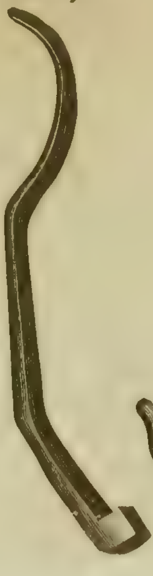
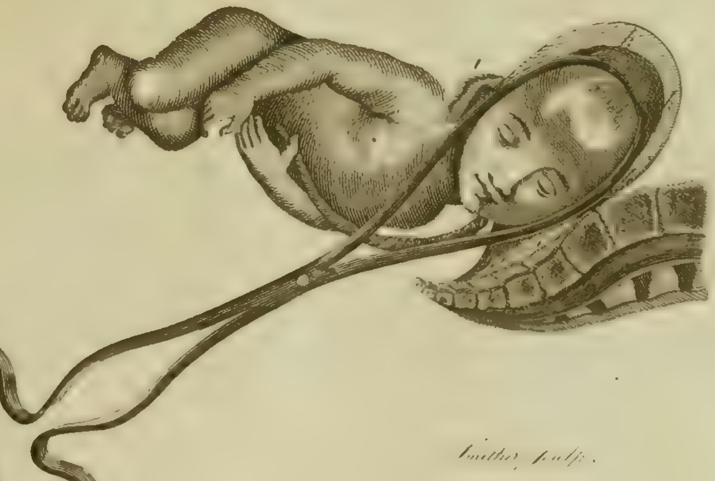


Fig. 31.



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